JOURNAL

OF THE

DEPARTMENT OF AGRICULTURE

OF

WESTERN AUSTRALIA.

ISSUED BY DIRECTIONS OF

THE HONOURABLE THE MINISTER FOR LANDS.

EDITED BY

G. CHITTY BAKER.

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Vol. X. JULY 15, 1904. Part 1.

NOTES.

POULTRY TICK.—In the last issue of the *Journal*, on page 444, under the heading of "Care in Purchasing Poultry," it is stated in the third line that "Albany is at present *full* of tick." This should read *free* of tick, not *full*.

MR. COMPERE'S REPORT.—Mr. Campbell, the Director of Agriculture for New South Wales, has taken exception to certain statements made by Mr. Compère in his report published in the *Journal* for August of last year. In the absence of Mr. Compère, the matter of replying to Mr. Campbell's remarks must be held over pending Mr. Compère's return.

FRUIT SHOW IN LONDON.—Notice is called to a circular appearing in this issue, from the Secretary of the Royal Horticultural Society of England, inviting growers to forward specimens of colonial fruits, etc., for exhibition. While the time will be rather out of season for those in this State, yet there may be some classes that would be availed of. This is a matter that the Co-operative Society should take up.

CODLIN MOTH.—The following extract is taken from the report of the Chief Inspector under the Insect Pests Act:—"In dealing with the eradication of the codlin moth, the total number of trees likely to harbour this pest is 254, and are situated as follows:—173 Perth and vicinity and 81 in Albany and district. Of these I propose to have 40 grubbed out, chopped into short lengths, saturated with kerosene, and burned. The remaining 214 trees will be treated as follows:—78 trees will be cut back to eight or ten feet

from the ground, all prunings burnt, and then, together with the balance of 136 trees, which are mostly young ones and easily reached, will be sprayed with Paris green at least three times during the period the poison is likely to do the greatest amount of good. All fruit forming will be picked and burnt before it is fully developed, and will only be allowed to hang on the tree to act as a trap for the grub. By strictly carrying out these measures it is hoped that our efforts will be crowned with success."

COTTON CULTURE.—The following notes on cotton culture have been supplied by Mr. Berthoud, of the Government Experimental Plots, Hamel, on the culture of cotton:—"Sow late in the spring, when danger from frost is over. Drills four feet apart, with seeds sown, say, two together every two feet along the row; cover one inch in depth. Will germinate in about five days if the weather is warm and the soil fairly moist. Cultivate and keep free of weeds during the summer. Soil: Any good land will grow cotton, providing that it is deeply tilled and well manured, also retaining fair moisture throughout the summer. Manure: Bonedust applied broadcast at the rate of 1cwt. per square chain, and harrowed in before sowing the seed. The first bolls will be ripe in about six months from date of sowing." It is also notified that a little seed may be obtained for experimental purposes of the following varieties:—Abassy (Egyptian), Russell's Big Boll, Hawkins, Culpeppers, and Peruvian. The last four being from America. Application for seed should be made to the Director, Department of Agriculture, Perth.

ERADICATION OF SAN JOSE SCALE.—Mr. G. Wicken, Inspector under Insect Pests Act, in June, 1903, reported that Mr. G. W. Hester's orchard at Dalgarup Park, Bridgetown, was badly infested with the San José Scale. Out of 25 acres of trees, 13 acres were badly infested. Inspector Wicken has just completed this season's inspection of the above orchard, and reports that Mr. Hester, last season, fumigated all his trees, and then sprayed them twice. So well was the work done that the trees carried a good crop of clean fruit, and made excellent growth, and this year Inspector Wicken, after a very careful search, could only find 14 trees infected. Mr. Hester is to be complimented on the thorough way he has dealt with this scale, and we cannot do better than recommend other growers whose orchards are similarly infected to follow his excellent example. We should then soon have no San José scale in this State. The season for the active treatment of trees infested with the San José scale is now on, and such examples of signal success as this one should encourage others to do likewise. To give another instance of the value and efficacy of proper fumigation, we might quote the case of Mr. Cox at Coolup. Three years ago all the trees were fumigated, those infected being done twice, with the result that five subsequent examinations by the inspectors failed to find even a trace of the pest on any of the trees.

Cotton Plant—Grown at Experimental Plots, Hamel.

SILVER-EYES.

The following letter has been received by the Hon. the Minister for Lands from Mr. Cox, of Coolup, on silver-eyes:—

"I beg to remind you of a hurried conversation which I had with you at your office about 18th April, introduced to you by Mr. Rowley, *re* 'Silver-eyes as grape destroyers.'

"I think that it is universally admitted that the extermination of the silver-eye would be desirable; failing that, any diminution of their numbers would benefit fruitgrowers. Although by nature insectivorous, these birds are undesirable even from this point of view: they are seldom heard or seen in a vineyard except when fruit is available. At such times they certainly vary their diet with insects, but they have no discrimination, and I have found to my cost that they destroy friendly insects. At the present moment my citrus trees are badly infested with red scale because the silver-eyes in the summer ate all the ladybirds which used to devour the scale and keep my trees clean from this pest (comparatively clean, sufficiently so for commercial purposes). When the fruit is all gone they retire into the bush and leave the vineyards unaffected for good or evil.

"This pest is felt most severely by men with small patches of fruit. In a large vineyard the silver-eyes which find their way there will only destroy a portion of the crop, confining themselves to choice (to their taste) varieties, or else eating half a dozen or more of the outside rows of vines; in a vineyard of 100 acres they might destroy five or 10 acres. Thus, the loss to the large man would be from five to 10 per cent. But in a small vineyard such as mine, of nine acres, the birds sometimes get half the grapes, so that my loss in fruit is 50 per cent.

"Moreover, a man with 100 acres would probably require to keep only four guns going. I always keep one, and part of the season, two. Here again, in proportion to the size of our holdings, my shooting expenses are three times as heavy as his. Coming again to smaller holdings still, those who keep a couple of hundred vines for their own use: In seasons of comparative immunity from the silver-eye these people get some grapes, but in a year such as this it was impossible for them to save the fruit. Even if they kept a gun going they could not save any sound bunches, and they have found it cheaper to leave the crop to the birds and to buy for their own requirements. The number of people who own a few vines is far greater than those who own larger vineyards. Anything which will induce owners of fruit which attracts silver-eyes to destroy them whenever they can will provide a step towards their extermination or towards the diminution of their numbers.

"My idea is that if the Government would offer a reward for the skulls of these birds sufficiently high to pay for the ammunition required to secure them, many people who at present cannot afford to wage war to the death with them would find that it suited their purses to devote their labour to their destruction. Personally, I keep a gun or guns going as long as there is sufficient fruit to justify me financially, but towards the end of the season I get tired of paying for labour and cartridges, and for three or four weeks the birds work their will comparatively unmolested; but if my ammunition expenses were paid I would go on shooting as long as birds were plentiful.

"The Government would never be asked to pay for all the silver-eyes which would be destroyed. When the pest is at its worst, a boy can shoot a second bird in the time which he would waste in securing the body of the one shot, so that, when very busy protecting their grapes, people would not bother about the reward. Yet this reward would secure the death of great numbers of birds at a time when, without it, to shoot them would be too expensive.

"I suggest that the Government should offer 2s. per 100 for the skulls of these birds, the skulls to be delivered to justices of the peace in grape-growing districts only. I think that this would leave very little opening for fraud, as the price is not sufficient to induce people to kill harmless birds whose skulls might be palmed off to represent silver-eyes. In fact I cannot imagine circumstances under which similar skulls could be profitably sold for 2s. per 100 in this part of the world.

"As regards alternative methods of exterminating or diminishing the pest, poisoning has been tried by myself and by others, and we find that the birds may eat a bait once, but their relatives will avoid anything similar for the rest of the season. Elsewhere, where water is less plentiful than it is in this district, I have heard of success by using poisoned water.

"Birdlime is open to the same objection as poison: You may catch one lot of birds, but the rest become cunning.

"To scare the birds is utterly impossible; this is so well-known by grape-growers that I will not discuss it.

"As regards the possibility of protecting fruit by netting, choice patches on level ground can be remuneratively protected in this manner, if the owner has capital at his disposal. The cost would be from £100 to £150 per acre (I am not in possession of any practical figures), but many properties could not be so protected, and all fruit unprotected would be more severely punished. The owners of protected vineyards would cease to destroy the birds, and these would increase in numbers.

"It has been suggested that by planting figs or mulberries the birds, preferring these, would not molest the grapes; but if we provide free food for the birds, and immunity also, they will increase in numbers and constantly require fresh plantations. I have seen

a minute by Mr. Crawford, Acting Director of Agriculture, to the effect that, this being an exceptional season on account of the failure of the usual food of the silver-eye, the red-gum blossom, no complaints are likely to be heard of the pest in normal years; but my experience, extending over eight or nine years, is that the birds are steadily increasing in numbers, and are yearly more destructive. Moreover, whereas the grape crop matures comparatively punctually from February to the end of April, the red-gum blossom comes out more erratically, and lasts only from four to six weeks. While it is out, it protects the grapes almost perfectly, so fond are the birds of it; but it only protects the main crop, which provides wine or is saleable at a very bare margin of profit on account of the glutted market. The valuable late grapes are at the mercy of the birds.

"In this letter I have dealt with my own experiences chiefly, and if you have still any doubt about the advisability of the policy which I advocate, may I suggest that you cause this letter to be inserted in the *Journal* of the Department of Agriculture, and invite comments from grape-growers.

"Before closing, may I indicate a possible method of solving this difficulty by the adoption of a policy which your Department has approved in other branches of its work. It is that of parasitising the silver-eye; I indicate a policy only, but must refer you to your ornithologist for details.

"I do not apologise for the length of this letter. I have by no means exhausted my subject; in 15 minutes of conversation I could have expounded it more clearly and thoroughly.

"In confidence that you will take action if you are convinced that you can benefit vineyard owners thereby."

"SILVER-EYES" (*Zosterops gouldi*).

NOTES THEREON AND UPON THEIR SUGGESTED EXTERMINATION.

By ALEX. WM. MILLIGAN.

For the information of the Hon. the Minister for Crown Lands.

From a perusal of the above letter I glean what is generally known and admitted regarding these birds, namely, that they are very destructive to certain fruits, but on the other hand are of great service to orchardists, vignerons, and gardeners in the destruction of noxious insects. As a debit against the latter, two of the writers named allege that the silver-eyes devour such useful and invaluable insects as "ladybirds." It also appears from the reports mentioned that the birds were unusually

destructive during the past fruit season, the reason assigned being the abnormal scarcity of the flowers of the red-gum eucalypt (*Eucalyptus calophylla*), for which it is said the birds have a great partiality. Various suggestions are made in the report, notes, and letter for the extermination or the whole or partial suppression of the pest.

Summarised, the position is this:—

(*a*.) The birds cause great damage to the fruit crops.

(*b*.) They also destroy "ladybirds."

(*c*.) They perform useful services to man in the riddance of noxious insect pests.

Now, before devising or attempting to devise any scheme having for its object the wholesale destruction of the birds, I think that we should consider all aspects of the question, as the adoption of such devices might result, as Mr. Despeissis aptly and appropriately expresses it, in a "signal disturbance of the balance of nature."

Allowing that great damage is caused to fruit crops by the birds, nevertheless I cannot admit, until positive evidence has been adduced, that they devour "ladybirds," as alleged. My reasons for not making the admission are, firstly, that the slender mandibles of the birds are eminently unfitted by nature to seize and break hard-shelled insects such as "ladybirds" are; and, secondly, that by their close alliance to the honey-eaters their food would consist primarily of the honey liquids of flowers and the small insects frequenting the latter, and secondarily of the "soft-bodied" forms of insect life.

As regards their useful services above indicated, the result of my own observations point to the fact that the services rendered are invaluable. I recall one instance. When living at South Perth about three years ago, the garden attached to the house I occupied contained a large "marguerite" bush. One Sunday afternoon, whilst I was lounging on the front verandah in view of the bush, a silver-eye made its appearance, and immediately descended into the bush, returning instantly with a large green caterpillar which, after battering against a picket of the fence, it swallowed. The descent was repeated time after time with the same result, until it accounted for 10 of them. Having satisfied its immediate requirements it left. Before it had finished, however, a second one appeared, and at once engaged itself in the same pursuit, with equally satisfactory results. Taking the above as a basis, let us try and compute the number of caterpillars a bird can, and probably does, destroy in a day. Having made a rough estimate, then make a further computation of what 20,000 birds (this number of birds is often shot in a single orchard in a season) would destroy in nine months. This being done, then consider what the result would be if the birds were exterminated.

It might be urged that other native birds would perform the services. To this I, as a man who has made a life-long study of Australian bird-life, would answer, "Indicate those birds." It is admitted that there are a few insectivorous birds in the State, but as a rule they avoid the haunts of man. The orchardist and vigneron, doubtless, will say, "That is all very well. Admitting that they rid flower gardens as claimed, do they perform the same services for us." On that point I would immediately refer the questioner to the work of my old friend, Mr. A. J. Campbell, F.L.S., intituled "Nest and Eggs of Australian Birds," where, under his description of the Victorian "White-eye" (or "silver-eye," as we call it), he quotes an orchardist (the late Mr. T. H. Potts) as follows:—

> "The white-eye, or blight-eating bird, with cheerful note, in crowded flocks, sweeps over the face of the country, and its progress clears away multitudes of small insect pests that persistently beset a great variety of cultivated plants and trees. It is true that in spring-time it insists in taking boldly and openly its retaining fee for its services, probing with its needle beak the luscious pulps of cherries that hang most temptingly in clustering ripes, red and purple. The fruit-grower may not just *then* like to admit the claims of the white-eye, deeming it an inconvenient time for that kind of visitation; but we believe the little worker has honestly earned his wages."

Let me furnish additional testimony. Mr. Robert Hall, a Victorian naturalist, in his book intituled "The Insectivorous Birds of Victoria," in describing the white-eye, quotes Mr. W. H. F. Hill as follows:—

> "Amongst the birds, the silver-eye is the chief enemy of the case-moth, destroying the young in great numbers. Indeed, but for these useful little birds the case-moths might easily become a serious insect pest, as they threaten to be in various city parks and enclosures where the silver-eye does not dare to go."

Mr. Hall goes on to say:—

> "In New Zealand the 'Transactions of the New Zealand Institute' renders a very praiseworthy account of the good done by this bird as an aphis destroyer."

It must be remembered that in Victoria there have been many species of foreign insectivorous birds introduced, such as sparrows, linnets, thrushes, blackbirds, starlings, and mynahs, a fact which goes to prove the superiority of the native silver-eye in checking local and noxious insects of the kind mentioned.

I have also the testimony of Mr. W. J. Reardon, the proprietor of an extensive orchard, near Guildford. That gentleman informs me that so satisfied is he that the silver-eye destroys the

fruit-fly and its eggs and larvæ that he does not allow the birds to be molested. He mentions that one year his neighbours waged ruthless war against the birds, with the result that their orchards were infested with fruit-fly while his was almost free.

Again, we must or should profit by the experience of Frederick the Great, of Prussia, who carried his prejudice so far against the common sparrow (*Passer domesticus*) as to issue a decree that all individuals of the species should be shot whenever they appeared, and, as an inducement to the successful issue of his decree, set a price upon their heads. For the result, I append an excerpt from "Cassell's Book of Birds," vol. 1, page 134:—

> "The poor sparrows were immediately pursued in all directions, and some thousands of dollars expended in the course of a few days by the State as payment for their destruction. The natural result of this barbarism followed. The trees that had been supposed to be injured by the birds were so covered with caterpillars and other insects as to be not only *barren of fruit* but also quite denuded of their leaves, so that the King was at once obliged to recall his decree, and had to command that sparrows should be brought from all parts in order to repair the mischief that had been done. These birds have been introduced into Australia in the hope of their being similarly useful. . . . In old Gesner's time they (their bodies) were applied to a very different purpose; two spoonsful of burnt sparrow was supposed to be a cure for avarice, and the flesh of the nestlings, when applied with a little vinegar, was considered an excellent remedy for toothache. According to Pliny, their brains were extensively employed in medicine."

From the foregoing I think sufficient has been adduced to warrant the arrest of measures for the extermination of the birds without first making exhaustive inquiry.

To that end, I advise that the Agricultural Department arrange, for one year, for a daily supply of fresh-killed specimens from well-known orchards, and that the specimens be dissected and the contents of their crops and gizzards be carefully examined and the results carefully recorded, and, if necessary, the contents preserved; and that particular attention be paid to specimens obtained during the months of November, December, January, February, March, April, and May—those months being, as Mr. Baker informs me, the period within which the fruit-fly is most in evidence. Such a series of examinations would conclusively and positively prove what noxious insects the birds eat, and whether or not "ladybirds" and other useful insects are included in the birds' diet.

During the period named, experiments might be made by the Department for preventing, or, at least, mitigating, the evils complained of. In that connection I advise that the Department

arrange with orchardists and vignerons to plant in the vicinity of their orchards and vineyards plants bearing honey-secreting flowers which attract minute insect life, and particularly the plant known as the "Honey-plant." I am prompted to make this recommendation upon the strength of the statement that the birds are more destructive to fruit when there is a scarcity of red-gum blossom. As regards the "Honey-plant," I recollect well that in my shrubbery in Gippsland, Victoria, the wattle-birds, and in fact all the local honey-eating birds, deserted the bush flowers in spring-time and summer to come and feed on the nectar from the flowers of this plant. The honey liquids were secreted so abundantly that, notwithstanding the daily attendances of numerous birds, depositions of such liquids could be found on the soil beneath the flowers.

I also advise that experiments be made by attaching, in a conspicuous manner, strips of bright-coloured fabrics in suitable positions among the vines. I recollect reading in a trustworthy publication, some years ago, that the common sparrow will not approach fruit trees to which strips of blue cloth are attached. This is, indeed, probable, as the fact is well known to entomologists that insects possessing bright colours are not preyed upon but avoided by birds, and particularly those where the predominant colour is blue.

If these and any other experiments which hereafter may be suggested fail, then the protection of fruit trees and vines by netting or some other cheap and serviceable device of a similar nature must be seriously considered. In this respect the Government might assist orchardists and vignerons whose means will not presently admit of the outlay. Assistance of a similar kind is provided by the Rabbit Suppression Act for pastoralists and agriculturists. The first cost, no doubt, would be considerable, but as against that the annual cost of men, guns, and ammunition would be saved. The netting would require to be affixed to light frames, so that after the gathering of the crop the frames could be removed and the birds allowed to do their good work.

Mr. Despeissis, in his notes, speaks of the employment in orchards of pinioned butcher birds as a means of "terrorising" the silver-eyes. I think that such would not be productive of any permanent good. The pinioning would, of course, deprive the butcher birds of the power of attack, and the silver-eyes would soon learn that there was not any real danger. The same objection would apply to hawks. As a fact, there are not many hawks which attack small birds, and a number of instances are on record where Australian finches and other small birds have actually attached their nests to those of hawks, and both have brought up their families in amity. Of the hawks, the sparrow-hawk is the arch-enemy of small birds. I venture to say that the despised crows destroy more eggs and small birds than the hawks. Some years ago, I made the experiment of chaining two tame eagles under some apricot trees in my orchard in Gippsland. The result of the experiment was not only unsuccessful but ludicrous. The presence of

the eagles did not deter the birds in the least. In fact, after satiety, they used to alight upon the framework of the cage, within a few inches of the eagles, and preen their feathers.

If, after the series of examinations before referred to, the results render the extermination of the birds an absolute necessity, "cyanided" water, sweetened with a little honey, might be adopted. Small vats might be placed in shady places in the orchards, but so elevated as to be out of the reach of irresponsible and incautious persons and domestic animals. The cyanide water on the goldfields has proved very destructive to bird-life. At Meekatharra, in the Murchison District, as many as 950 small birds were picked up in one morning in the vicinity of one of the mines there, all poisoned by drinking at the unprotected cyanide vats. Marsupials also suffered in the same degree proportionately. If this process were adopted, it would be necessary, where practicable, to close all access to other drinking places, so as to force the birds to drink at the vats. It would be imperative that simultaneous action be taken by all owners of orchards and vineyards. The present system of shooting should also be adopted at the same time, and the nests and eggs of the birds destroyed in the preceding breeding season. A combination of all these methods would straight away diminish the numbers in a material degree, particularly as the birds for the most part leave the bush and collect at the orchards in fruit season.

As regards the dissection and examination of specimens, I am sure that my friend, Mr. Woodward, the Director of the Western Australian Museum, Perth, would gladly see that the same were properly carried out.

Whilst upon this subject, I beg to offer the suggestion to the Minister that for the purpose of protecting and preserving the insectivorous birds of the State in the interests of the fruit-growing industry, the Government cause to be issued attractive coloured plates of them, with appropriate letter-press as to their life histories, and have them exhibited in all the Government schools in the State. The suggestion does not savour of novelty, as such plates have been published and distributed in other States. These, however, lost a great deal of their effectiveness in having all the birds figured on one chart, instead of a few separate, well-selected examples. If the suggestion were approved, I should, for my part, if required, be delighted to give my assistance (in an honorary way, of course) in helping what I consider is going to be one of the biggest of our industries. There will come a time when the South and South-Western portions of this State will be the "Orchard of Australia." Good lands, a regular rainfall, and a closer proximity by many days in point of time to the European and African markets must, of necessity, produce this result.

In conclusion, I must acknowledge Mr. Chitty Baker's deep interest in this subject, and the information he has given me on the life history of the fruit-fly.

Pumpkins "Crossbred, No. 4," and Melon "Triamble" grown at Hamel Experimental Plots.

STATE FARM, HAMEL.

SEASON 1903-1904.

Report on Miscellaneous Plants.

By G. F. BERTHOUD.

The following miscellaneous plants were all cultivated in the garden, under ordinary conditions, without irrigation:—

Soil: Good dark loam, retaining some moisture all the summer, and fairly manured with suitable fertilisers.

PUMPKIN (*Cross-bred No. 4*).

Local, new variety; seed sown 8th December; growth very vigorous, vines covering a space of over 60 feet across; prolific bearer; fruit 20 inches in diameter, by a depth of 12 inches; shape round, slightly ribbed, and flattened at the stem and blossom ends; skin dull orange, covered over with grey netting; flesh deep orange, of good depth and quality; weight to 84lbs. each. Yield good, rate of 40 tons per acre. Useful for stock-feeding.

PIE-MELON (*Triamble*).

Sown 9th December; growth strong and prolific; fruit large; distinct form, 15 inches in diameter and 12 inches in depth; round; depressed at the stem and blossom ends; skin light green; flesh firm, of a yellowish white colour; seeds, few in number, of a bright green; makes good jam; weight up to 56lbs. each; fairly even in size. Yield good, at least at the rate of 40 tons per acre.

BANANA (*Musa paradisica*).

The common variety; suckers were planted two years ago, along the edge of the brook, and have made luxuriant growth, forming strong clumps, which fruited during the past summer. Owing to the cool climate in the winter and spring months, the bunches did not fill fully, four dozen fruit to a bunch being the best. Fruit of good size and quality, ripening on the plants from January to March; height to 12 feet; valuable plant to cultivate for family use or market. Requires rich, moist soil and warm climate.

Atikehel.

Introduced from Ceylon; planted November, 1901; growth healthy and vigorous: will fruit during the coming summer; height 12 feet; promising, hardy, and strong-growing kind.

Ambuhouarowala.

Introduced from Ceylon; planted November, 1901; growth very slow and weakly; does not appear to be suitable for this locality; height five feet.

Kolikutta.

Introduced from Ceylon; planted November, 1901; growth healthy and fairly strong; height six feet; may fruit next summer; fair variety.

Chinese Dwarf.

Introduced from Ceylon; planted November, 1901; growth dwarf, but healthy and good; owing to its low habit the plants are not liable to be injured by high winds; will fruit in summer; promising variety for this locality.

COTTON (Cultivation).

Soil, lowland loam of good quality, worked to the depth of 12 inches; complete manure, applied at the rate of 6cwt. per acre at time of sowing; seed sown in drills four feet apart; plants every two feet along the row. The best time to sow here is early in October, covering the seeds half-an-inch deep. Under favourable conditions the germination takes place in four or six days. The cut worms are very partial to the young plants.

Early Prolific.

Gossypium variety; local seed; sown 27th October; later than usual, owing to the soil being cold and sodden; germination fairly even; young plants partly eaten off by the cut worms; habit dwarf; height two feet; fairly prolific; large round bolls, well filled; ripe end of April; staple short, of good quality; dwarf, hardy variety.

Peruvian Gossypium religiosum.

Imported seed; sown 14th November; germination even; growth very vigorous; height four feet; plants did not produce any flowers. The young shoots were damaged by frost in May. If the plants survive the winter they will produce a full crop next autumn. This strong-growing sort requires a warm climate.

Abassy, Gossypium variety, from Egypt.

Sown 23rd September, 1903; growth vigorous. The plants survived the cold, wet winter and made good progress during the past summer, producing a fair crop of about 200 bolls per plant. The bolls are long, pointed, and well filled with nice silky lint of good quality. Part of the crop ripened in April, the balance in May. The latter were damaged and discoloured by rain. Good kind for warm climate. Plants four to five feet high, strong and bushy.

PEANUT *(Mammoth Bush).*

Arachis hypogea.

Imported American seed; sown 6th October, in drills 30 inches apart; plants every 24 inches along the row; germination fairly even; growth healthy; habit prostrate, each plant covering a space of about three feet; pods large and well-filled; crop not dug at time of writing. This new variety has given the best results of any tried here.

This annual plant should be sown during the spring; the most suitable soil, that of a light and calcareous nature, retaining fair moisture during the whole summer; manure with superphosphate of lime; foliage very like clover; flowers pea-shaped, yellow. After blooming the stalk and young pod is pushed into the soil, beneath which it matures.

PINE APPLE *(Ananas sativa).*

Two varieties of this plant were planted here two years ago. Although healthy, they are making very slow progress. Owing to the long, wet and cold winter this valuable fruit cannot be profitably grown here in the open ground; would fruit without artificial heat if grown in pots under glass during winter and spring.

ARROWROOT PLANT *(Maranta arundinacea).*

Tubers introduced from Singapore; planted 18th October, 1901; they have made very slow growth, the climate being too cold for the profitable culture of this valuable plant. Might prove successful in the Northern parts of the State.

TANSY *(Tancetum vulgare).*

Imported seed; sown May, 1902; only two plants came up; the seed does not germinate very readily; the past season these plants made strong growth; height four feet; flower yellow; some seed matured; but the best mode of propagation is by division of the clump; a very hardy plant will grow well on moist soils. An infusion of the foliage is said to be very effective in expelling bots from horses; if this is true, all farmers should grow a few plants.

ANDROPOGON MUNICATUS *(Kus-kus Grass).*

Root introduced from Ceylon in 1902: the plant came on nicely, and now forms a large, thick tussock, with luxuriant straight foliage; six feet high; has not yet flowered; requires a warm climate; is hardy and of easy culture. Indian mats and awnings are made from this grass. A fragrant essence is distilled from its roots.

RAMEE OR RHEEA *(Bœhmeria nivea).*

Small roots introduced from Ceylon in 1902; these came up nicely, and have since grown into large plants, with shoots to 8 feet

in length; said to be very valuable for its fibre, which is finer and stronger than hemp. Yield: One ton of green branches will give 1cwt. of fibre. Plant requires warm climate and good strong soil to grow it properly. I do not think it would be payable here.

SISAL HEMP (*Agave Rigida*).

Native of Mexico; small offshoots lately imported have now made healthy growth, and are likely to do well here. The fibre of this plant is strong, straight, and glossy; used for making binder twine. May prove to be a valuable introduction for extensive culture in this State.

FULLER'S TEASEL (*Dipsacus fullonum*).

Imported seed; sown in spring, 1902; hardy perennial; grows very freely, forming large plants, which flowered well during the past summer, producing a large number of fine seed heads. This plant grows exceedingly well here, but it is doubtful if there would be a local market for the produce.

TOMATO.

During the past season I cultivated eight trial plots of new American varieties; of these

Chalk's Early Jewel
Dwarf Stone
Kansas Standard

proved to be of superior merit, producing freely large, smooth fruit, of rich colour and fine quality.

WATER MELON.

The past summer I planted trial plots of six new kinds, including one from New South Wales. All grew well, producing large and luscious fruits. I consider the two kinds, "Halbert Honey" and "Seminole," to be the very best grown here.

PEARL MILLET (*Penicillaria spicata*).

Imported seed; sown 9th December; germination quick and even; growth tall; foliage luxuriant; plant stools out well; stem upright, over eight feet high; useful for green feed; should be cut frequently before the stems become hard; seed ripe in May. This well-known plant has lately been sent out under new fancy names, such as "Man I's Wonder," "Forage Plant," etc., etc., and high prices charged for the seed.

HORSES: THEIR BREED AND MANAGEMENT.

By R. E. WEIR, V.S., C.I.S.

The following article was used by Mr. Weir in a lecture given by him, in Perth, on the 1st inst.:—

In most cases the measure of success achieved by stock-owners is regulated by the amount of care and intelligence exercised in the conduct of their affairs generally. Given careful and systematic management, success is almost assured, though without these essentials failure is about as certain. The first and most important consideration in order to lead to improvement of any kind of live stock is careful selection. It has been generally recognised that the progeny inherit invariably a modification of the form and attributes of the parents; therefore, as the latter, so will the former be. An improvement once established in an animal, whether by inheritance or by special management, is susceptible to transmission to succeeding generations, and by careful and intelligent attention to the selection of future partners for the offspring the alteration may become fixed, and be a typical character of the improved race.

A breeder, in order to improve his stud, first decides on a particular strain of blood which, to his fancy, is likely to give the best results in his particular case; thus, by judicious mating, he may ultimately succeed in this direction. Hence the importance of pedigree, which enables one to trace the character of the animal's forbears.

It must be admitted that some promising-looking descendants of good stock do at times turn out unsatisfactorily, but the chances of their doing so are very much less than those whose early character is their own appearance.

It is, however, possible to carry respect for pedigree too far, and persist in breeding from pedigree animals only on account of their lineage, and without regard to their other points. This is a serious error.

No matter what kind of a horse is to be bred—be it a racer, hunter, or draught—the best of this particular kind should be selected for this purpose, and the weeds always discarded. Sound constitution, free from disease or defects, good temper, together with appropriate feeding--these have given us our excellent draughts, the swift thoroughbred, and steeplechaser.

In-and-in breeding has been practised by skilful persons with excellent results so far as high-bred stock is concerned, inasmuch as it has assisted the transmission of the special fixed qualities

which has made certain strains of pedigree stock so famous and valuable; but this form of breeding demands the greatest care, for if long persisted in it exerts a very unfavourable influence on the rigour of the animal, and the tendency to disease is greatly intensified thereby. To get very fixed character with undoubted power to transmit its qualities it is necessary to keep working on the same strain of blood, but under general circumstances it is not necessary to keep very close relations. The more closely you keep to one blood, the greater vigilance is required to avoid the defects to which that strain has the strongest tendency, and so avoid any symptoms of disease.

INFLUENCE OF THE SIRE OR DAM.

This is a very important matter, especially if the breeder be a new beginner, and wishes to secure a certain type of animal. Science teaches us that the male, as a rule, transmits the outward appearance, while the internal organs take after the dam. Whichever type is secured, this will be more readily obtained from the animal which is in the full rigour of constitution. The influence of the sire is, however, of more importance than that of the mare, more particularly in the matter of soundness. This will be made clear to you when you consider that a mare only produces one foal per year, whereas the sire may be the parent of from 60 to 70 in the same period. For this reason the licensing of this class of animal should be made law within this State, such license to be renewed annually on the certificate of a duly qualified official.

CONDITION OF PARENTS.

To achieve success in this direction, robust health must be insured with good feeding and exercise or moderate work. Obesity as well as poverty are both unfavourable. Mares doing regular work are more likely to give better returns than animals which are more or less pampered. The same applies to the other sex.

HORSE REARING IN WESTERN AUSTRALIA.

Of all animals, the least attention has been given to the breeding of this class within the State, the reason being, no doubt, due to the great profit derived from both cattle and sheep. All this has changed, however, and those who have made a study of this branch of animal industry, are now reaping a rich reward. Horses, especially draughts, are bringing much larger prices at the present time than has ever been known to rule before. The large numbers of farmers that are now flocking to the State have been, to a certain extent, the cause for this demand, but when those are finally established on the soil, then will arrive the time for this industry to receive a stimulus that should, at least, supply the want of the State.

BREEDS OF HORSES.

Agricultural and heavy draughts comprise the Clydesdale and Shires. The home of the former is in Scotland, where a great

amount of study and care has been taken to produce an animal that I may safely say has no other as its equal where a combination of strength and activity is required. The original breed of this animal is supposed to originate from a Flemish sire and well selected native Scottish mares. The prevailing colours are bay and brown, height about 16 hands, and his breeding is manifested in the neat, handsome head, and symmetrical body, which is deep in the girth, round and short. Formerly the legs were rather long, the bone round, and the hair coarse and curly, but by judicious breeding those defects have now been remedied, the present-day Clydesdale being noted for their short, muscular legs, flat bone, and fine silky hair. Well bred Clydesdales bring large prices, 1,000 guineas being commonly paid for well-known sires. At a clearing sale in Victoria, recently, a two-year-old filly brought the phenomenal price of £250.

SHIRE HORSE.

The Shire Horse may be described as a true cart-horse of no particular stamp, colour, or breed, but the mixture of very choice country horses, resulting in a large, well-built, and powerful animal, more placid and stronger than the Clydesdale, though less valuable as a sire, inasmuch as he is less certain in transmitting his good qualities; moreover, his pace is slower, and he does not excel in anything beyond a smart walk. The head is generally large and heavy, the body large and roomy, the hips wide, and the loins broad and muscular; the forearms and thighs are long and powerful, and the hocks broad and deep; the legs are very hairy, the hair (which should be rather silky) falling thickly over the hoofs. This animal is used principally for heavy cart work, and no horse may be compared to it when a short heavy pull is required, such as in shifting railway wagons, etc. They are particularly mild in temper, and are easily guided both with the voice and whip.

SUFFOLK.

This is a breed which is more commonly known as the Suffolk Punch, and is undoubtedly the most typical agricultural horse, although not much in evidence outside the county of that name in England. He is of a distinctive chestnut breed, is easily kept, and for their hardy nature are undoubtedly to be recommended for use in this State. They are a class of animal easily disposed of, and sell readily at remunerative prices. They are specially serviceable as van horses, where speed is required as well as endurance and strength. They also are easily kept, seldom being noticed in poor condition. Their height is about 16 hands, with great width both fore and aft, short legs and hard feet. Formerly they were very prone to unsoundness, but with judicious breeding many of the old defects have been removed, and, with the exception that they may still be a little light of bone below the knee, little or no fault can be found.

HUNTER.

There is no doubt that a perfect hunter should be a perfect horse, combining in himself the qualities of speed, strength, endurance, and good temper, with excellent action to insure safety and certainty in going over rough ground and overcoming high obstacles. He should be endowed with vigour, stability, and promptitude in movement, and, above all, should have a good mouth. His breeding should be as nearly thoroughbred as possible, but when heavy country has to be traversed, then a half bred, or three parts, is to be desired in order to get the extra weight. A hunter may be described as having the outlines of a cob, breeding of a racehorse, size of a carriage horse, and action of a hack. A good high and sloping shoulder is absolutely necessary, also good limbs and joints; the loins and hind quarters wide and strong; thighs long and muscular, while his wind should be par excellence. He should also give signs of a good constitution and placid temperament.

HACKNEY.

The old-time hackney was essentially a riding horse which could gallop, trot, and stay, and some very notable feats in trotting have been done with this class of horse. The present day hackneys have been crossed with the thoroughbred, so that they frequently resemble the latter class of horse in appearance. Very large prices are frequently given for such animals. In 1902 a purchaser from America gave £3,000 for a well-known sire. The hackney's height is from 15 to 15·2. He should walk at the rate of four miles an hour, and trot from eight to twelve with comfort. His action should be easy, true, and level, neither too high nor too low, and in order to insure this, his make and shape should be as nearly perfect as possible; head small with fine nostrils; large, clean, and well-defined mouth, small lips, clean and firm; ears small, fine, and pointed; eyes large and prominent; neck long and somewhat thin, longer on its upper surface and convex. The head should be well set on the neck; wither not too fine, thick, or low; shoulder long and oblique. If the shoulder be straight or short, the saddle will be too forward, and should the animal stumble, he runs the chance of falling, breaking his knees, and perhaps the neck of his rider. The chest should be deep and moderately wide, forearm long, with muscles well-developed; elbow long and prominent; knees large and wide. Calf knees (those that incline backwards) or buck knees (those that recline inwards) are to be avoided. The cannon bone to be strong and short and perfectly straight; tendons behind well developed; fetlock joints large and flat; pastern neither too long or short, but neither too large or small; back rather straight, and not too long, ribs long and oval; hindquarters long, deep, full, and broad. The distance from joint of haunch to hocks should be great. The stifles prominent, and from there to the hocks, large and full, point prominent, and the leg below should incline slightly under the body, but should not be

cow hocked. Tail should pass in a straight line from the croup, and the drop in a graceful curve.

CLEVELAND.

This is a distinct breed, common in Yorkshire, England, chiefly used for coaching, though proving very successful for agricultural purposes. The good carriage of head, neck, and tail rendering them showy carriage horses. The breed has a tendency to highness in the loins, and being heavy of the forearm, makes them, as a rule, unfit for saddle work. The height is about 16 hands, and the only recognised colour is bay. Tradition points to a back cross with Yorkshire cart mares as the foundation of this breed, which at present is not in a very prosperous state.

RACE HORSE OR THOROUGHBRED.

Points: Shoulder blade long, humerus short, forearm long, cannon bone short, pastern long, pelvis long, thigh short, tibia long, head short, neck long, back and loins short, croup long, bones of tail short.

ARAB.

Our present-day Arab is the outcome of a carefully selected pony which is bred in Arabia. The principal colours are bay, brown, chestnut, and grey. The most characteristic physical point about the arab is the peculiar way he carries his tail, being well elevated and usually held to one side or the other. The tail is set on very high, and the muscles are very well developed. The hair of mane and tail is never coarse. The animal has a handsome and very intelligent head, broad forehead, large kind eyes, well-carried ears, well-developed neck, with shoulders well sloped; good fore-legs, with strong sloping pasterns, well adapted for either hard or fast work; loins flat, broad, and powerful; round barrel and length of back ribs, levelness of croup, and carriage of tail. He is without equal amongst horses, the large development of his muscles of his fore hand and loins making him a good weight-carrier for his size. A fault common to the Arab is his weak hocks, being frequently deficient in bone. The height is about 14 to 14·2.

POLO PONY.

Speed, staying, and weight-carrying power are the chief requirements of the polo pony. He should be light in front, with sloping shoulders, strong hocks, and his legs well under him. Goose-rumped will not be detrimental.

FEEDING.

The subject of food and feeding horses is necessarily one of great importance and constantly impresses itself upon owners and attendants. In a natural condition the food of the horse is green, and there can be no doubt that upon this diet the horse is maintained in the healthiest form, and can also perform a certain

amount of work on this alone; but when stabled and treated artificially and requiring to undergo severe exertion, food of a more concentrated and nutritious quality is demanded, and this has to be given in a regular systematic manner, and in quantities in proportion to the demands made on the system and requirements of health; regard must also be paid to age, condition, season, etc. Young, growing animals for instance must have materials for their development as well as to compensate for the loss of time while they are at work. Also more food is required in cold weather than in hot.

The main secret in feeding is to give such food and in such a manner and quantity as will maintain the horse in perfect health, at the same time having regard to the service required of it.

Food should consist of the two principal constituents which are required to sustain the body, viz.:—Albuminous or Nitrogenous, which is needed for building up the muscular and other tissues and repairing the waste of these. Non-Nitrogenous, such as starchy or fatty matter, which is chiefly burnt up in the body to maintain animal heat,—a combination of these two principals is necessary in all foods. In addition there is woody fibre and salts of several kinds which act in an important manner on the body. The common method in England is to feed on oats and hay, the former giving 52 per cent. of heat-producing matter and 12 per cent. of flesh-forming matter in 100 parts.

CONDITION OF THE FOOD WITH REGARD TO QUALITY.

If the land on which the food is grown be poor in quality the produce will be of similar value, but if the land be manured, an improvement in both quality and quantity will be secured. Formation of the soil also affects the quality; for instance, oats reared on clay land are superior to any other; rye flourishes better on a light sandy soil; a light chalk, a light grain, and with loamy land, a full plump grain. Old hay is preferable to and more valuable than new, and the same applies to cereals.

Feeding poor land with manure not only gives you an increased yield, but the nutritive value of the crop will also be improved. The time of cutting also alters the nutritive value of the food. Hay cut late has lost much of its properties, whereas if cut too early it is prevented from reaching the full extent of its nutritious matters. Seasons also affect the quality of forage, as, when too dry, the nourishment has not been provided, and when too wet it is frequently badly saved.

Food should always be given clean, as when it is dirty it frequently causes bowel complaints, and sometimes death occurs. Food affected with rust, mouldiness, etc., should be avoided, or if it must be given it should be scalded, so as to destroy all fungi.

DIGESTIBILITY OF FOOD.

The digestibility of foods is an important consideration in feeding, as with some kinds more is absorbed with the system than

with others, while with scarcely any of them is digestion complete throughout, a portion always being thrown out of the body undigested, no matter what amount of preparation it may have gone through. Thus, hay cut as soon as it is ripe is digested more easily than when cut at a later stage of growth. The same applies to young plants containing more albuminoids and less woody fibre than those of older growth. Roots, however, such as carrots, turnips, potatoes, and mangolds, have their nutritive value increased by age, since the production of sugar and starch increases with growth. The digestibility of one food may be increased by the addition of a second or third different kind, and a decrease may also be effected the same way. The preparation of foods will increase the facilities of digestion, such as crushing grain when covered by a thick husk; thus, oats are usually given crushed, and hay contains chaff in order that it may be more easily assimilated.

CHANGING FOOD.

Care is necessary when changing from one food to another. A change from dry to green and *vice versa* often upsets the digestion.

MAIZE.

This has become a very common diet for horses, and in Sydney forms the chief article in feeding those horses which do moderate and slow work. Compared with oats, it contains more heat-forming elements and rather less flesh-making matter. It should be at least a year old, and clean. New maize is distinguished by its softness.

BEANS.

These constitute an excellent ingredient in the feed of horses doing hard work. They contain much nutritive and stimulating matter.

BRANS.

These can hardly be looked upon as an article of subsistence diet. It is given as a laxative to sick horses, and mixed with the daily food to aid digestion.

PEAS.

These are of much the same composition as beans, and are therefore nearly as nutritious.

LINSEED.

This is seldom given to healthy horses, but as a mash combined with bran no better food can be given to an invalid animal.

QUANTITY OF FOOD.

It is a good thing to vary the diet now and again, such as giving a bran and linseed mash once or twice a week.

Horses should be fed at least three times daily. If possible no longer intervals than four hours should elapse between a meal. An

important point in feeding is to apportion the feeds in such a way that each will be consumed at the time it is given, as if any is left in the manger it becomes stale and sour, and the horse does not care for it afterwards. This is more frequently the case with chaff which has been wetted in the manger.

HEAVY DRAUGHTS (DAILY DIET).

Chaff	=	24lbs.
Oats	=	11lbs.
Bran	=	11lbs.

LIGHT HORSES (DAILY DIET).

Chaff	=	14lbs.
Oats	=	4lbs.
Bran	=	4lbs.

	Nitrogenous matter.	Non-nitrogenous matter.
Beans contain	26lbs.	46lbs.
Oats „	12lbs.	52lbs.
Barley „	13lbs.	56lbs.
Maize „	12lbs.	67lbs.

OATS.

Oats are generally considered the best grain food for horses. Good oats are heavy, have a thin skin, and are clean, hard, sweet, and free from any musty smell.

WATER.

This should never be stinted. Preference is always given to soft water, and clean to dirty. The quantity consumed will depend upon circumstances. Some drink more than others. In hot weather more is required than in cold. After severe exertion, a great quantity is taken and also when feverish. Horses as a rule drink less water when they have access to it. It is therefore the best plan to allow them to have water frequently, even when doing fast work. If properly watered a horse will not drink more than is necessary. When exhausted or fatigued it may be necessary to restrict them. In such cases a small quantity only should be given, or if made slightly warm no harm will result, especially if a little oatmeal is mixed up with it. It is a wise plan to give water always before feeding, not after. Water troughs should always be kept scrupulously clean and the water often changed.

GROOMING.

Next in importance to food and water is grooming. The function of the skin is very important, and just in proportion as that function is maintained in activity so will the health of the animal be improved. Heavy cart horses which are much exposed to the weather do not require so much grooming as light horses. The former are not the worse for having a little grease in their skin to protect them from the cold and wet, but dirt of every description should be removed from the surface and all loose dandruff

brushed from amongst the hair. After being stabled wet from rain or perspiration, the skin must be thoroughly dried, and an hour or two later should be well brushed or whisped in order to promote increased surface circulation and cause a feeling of comfort for the night. A dandy brush is all that is necessary for the purpose.

FOALING.

In all cases where the mare and her progeny are valuable it is desirable that an attendant should be with her at the time of foaling, in case she should require assistance. Difficulty in foaling is not so common as with the bovine breed, yet with artificially-kept mares, and especially draughts, difficult birth and fatal termination is not uncommon. Towards the end of pregnancy the abdomen drops, the hind quarters and the flanks sink inwards, the movements of the young are seen to be more active, and the mare dull and sluggish. The udder also becomes enlarged, and secretes a fluid. At first this is dark-coloured, thick, and sticky, but about the day before foaling it becomes white, and has the ordinary appearance of milk. Foaling is usually sudden, and accomplished without assistance—in fact, the mare should never be disturbed if a natural presentation is apparent. Should, however, a longer time than usual take place, which is sometimes the case with young mares or those overfat, the circumstances demand attention, but not before some portion of the fœtus is visible, and this being found in a mal-position then it will be necessary to adjust it, and otherwise assist the mare in delivery. Whenever serious obstacles to delivery exist, the aid of an experienced practitioner should promptly be sought, and the animal should not, if possible, be disturbed until his arrival. After delivery, interference between the mare and foal is not often needed, the former instinctively attending to its progeny, and the latter soon approaching the teat. Sometimes, however, through fear or temper, the mare will not tolerate the foal, and gentle persuasion may then be necessary. Foaling as a rule takes place during the season when natural pasture is more or less plentiful, and the milk supply is better when grass forms the animal's diet. Draught and harness mares are sometimes put to work when suckling, but it is not judicious to do so until a month has elapsed after foaling, and then artificial food must be given in proportion to the amount of work performed; also, the mare must not be kept too long away from the foal. The foal is usually weaned in from four to six months, and this should be gradually effected, and the intervals between the times of separation extended until the foal can entirely subsist on such food as it is able to masticate.

FOAL-RAISING.

Nothing is more important for the future well-being of the foal than judicious raising during its early years, as then its constitution is at that state when development receives an impetus which insures good muscle and bone, with perfectly-formed organs.

When half-starved and badly kept for the first two or three years of their lives, no amount of attention will afterwards compensate for the lost opportunity of promoting free growth and full development in the foals; therefore the careful breeder will do justice to his young horses by supplying them with good food, and attend to their other necessary requirements. Thus, growth and condition should be watched, and diarrhœa and constipation guarded against, as they are quickly injurious to the young. If allowed to suck, the first milk constipation is not likely to occur; but should this be obstinate, a dose of castor-oil will relieve the complaint, and do no harm.

Foals soon begin to masticate; and when a month or two old, if necessary and convenient, a small quantity of scalded oats, made into a mash with bran (a little salt being added), when given every day, will stimulate growth. During the first year, grazing will give exercise and food to some extent; but as growth is rapid after this time, a good supply of artificial food should not be withheld. Crushed oats should be the chief grain. In winter shelter is necessary during the night, and the allowance of food should be increased. The same treatment should be continued until the animal is sufficiently matured to go to work, when it should be gradually broken in, care being taken that the animal is not over-exerted before the bones and muscles become thoroughly hardened and seasoned.

TRIAL SHIPMENT OF GRAPES TO ENGLAND.

It will be remembered that a short time back an experiment was made by the Department of Agriculture of shipping grapes to London. The final report has now come to hand, and is published for the information of all those interested. It was decided to send 12 cases of the Bridal grape grown in the Darling Ranges, and a case of Daira or Ohannez, a favourite Spanish export grape, to the Agent-General (Mr. H. B. Lefroy), in London, to be reported on by a prominent firm of fruitbrokers.

This was done, and when the consignment was placed on board the R.M.S. "Mongolia," on 11th April, Mr. A. Despeissis, the viticultural and horticultural expert of the Agricultural Department, reported to the Hon. the Minister as follows:—

"The consignment consisted of 13 cases. Twelve cases contained the Bridal grape from Mr. C. Cook's vineyard near Chidlow's

Well, on the Darling Ranges. The object of the experiment is chiefly to test the keeping quality of this particular grape, which is an Australian seedling of great promise. The thirteenth case contained some Daira or Ohannez grape, which is the favourite grape for exportation shipped from the port of Almeria, in Spain, to England and to America. These grapes were obtained from Mr. C. Harper's orchard at Woodbridge. They were selected, on account of their good carrying quality, in order to afford a means of comparison whereby to judge the same characteristics of the Bridal grape. The cases were not all packed alike. The Daira grape was packed in an ordinary fruit-case, with three compartments, and with the cleats nailed close. The compartments were lined with paper, and the bunches, with all defective berries clipped off, were solidly packed in clean cork-dust. The case was only covered and nailed down a day and a-half after picking and packing. Of the Bridal grapes, some were packed similarly, Mr. Cook using brown paper for lining the boxes. Some were packed with the bunches in rice-paper bags, with the cavities filled in with cork-dust. One case was packed without any packing material, as is customary when sending grapes from the coastal districts to the goldfields. In this instance the grapes had been picked the day previous to packing, in order to wilt sufficiently. On board the steamer they were placed, with the rest of the fruit cargo, in the cool-storage chamber. Two disturbing elements may affect this trial: the grapes were somewhat ripe, and the late rain had to some extent injured them. All the unsound berries, however, were snipped off the bunches, and they were handled and packed with all reasonable care. Those cases in which the grapes were packed in cork-dust weighed, gross weight, 35lb. to 37lb.—the cases weighing 7lb. to 7½lb., the grapes 25lb. to 27lb., and the cork-dust and packing paper 3lb. to 3½lb. The case, packed with Bridal grapes, by themselves weighed 43lb. gross, and contained 35¾lb. of grapes."

On May 14, Mr. Despeissis further reported as follows:—" As previously arranged with the grower of the Bridal grapes sent to the Agent General, the witness case was opened at the Government refrigerating works to-day. The grapes were picked five weeks ago. I also had in the cool chamber a witness case of the Ohannez or Daira grape. They were stored in a chamber with a uniform temperature of 40deg. to 42deg. Fahr., which is a few degrees higher than is supposed to be maintained in the cool chambers on steamers carrying a fruit cargo. I had in my office another case, packed in every respect like those shipped away. The inspection showed very few berries to be rotten, and the cork-dust around had prevented the moisture spoiling the berries on the same bunches. The bunches out of the chamber had their stalks fresher than those from the case stored outside. On being exposed to the open air, they soon, however, assumed a damp look, the moisture of the air (on account of the difference in temperature) condensing around the berries. Better results would be obtained by moving the grapes gradually from the cool chamber to the open air. So far, this experiment shows that,

as regards long-keeping and carrying capabilities, the Bridal grape may be placed in the same class with the Ohannez or Daira, which is noted for these qualities."

By the last mail from England the following letter was received from the Agent General:—"In reference to your letter of 11th April, I have the honour to forward copies of letters received from Messrs. Keeling and Hunt, with regard to the consignment of grapes referred to in your letter, together with their remarks thereon, and to report as follows: I arranged with Messrs. Keeling and Hunt, the well-known fruitbrokers, of London, to receive and report on the consignment. Eleven cases came to hand, and I attended at the firm's warehouse and saw the cases opened. Taking into consideration the distance the grapes had travelled, and the time they had been packed, their condition was wonderfully good; but, as they had all lost their bloom and fresh appearance, and the stalks had become discoloured and somewhat shrivelled, I saw at once they were unfitted for anything like a good market in London. Those packed in cork-dust arrived in decidedly the best condition. Those wrapped in paper only did not look so well, and those packed without any cork-dust or covering at all were in the worst condition. For carrying purposes, the cork-dust can, therefore, be recommended before any other. As stated above, I saw 11 cases unpacked. There were consequently two cases missing, one of which was the case containing the Almeira, packed in sawdust. You will observe from Messrs. Keeling and Hunt's letter of 19th May that the two missing cases were delivered to them empty, so that I regret to say I am unable to offer any opinion on the thirteenth case, containing the Almeira grape. The account sales disclose the result of the sale of nine cases of grapes to be on an average a little more than 2d. per lb., and to ship grapes from Western Australia at such a low price would, of course, be out of the question. For table use the grape must have a good appearance, and fruit in the condition of that lately forwarded from Western Australia would not, judging from what I have observed, fetch in the retail market more than about 6d. per lb. I am sorry for the loss of the the two cases, and although they were not of much value, I will go into the question of making a claim against the ship-owners."

The account sales for nine boxes of grapes were·—Two cases at 5s. 3d. each; three at 4s. 3d. each; three at 4s. each; and one at 3s. 3d.—total, £1 18s. 6d. As against this, the charges were 13s. 2d., the proceeds of the sale being £1 5s. 4d.

Messrs. Keeling and Hunt's report, dated 18th May, was as follows:—"Two boxes were sent to Westminster, in accordance with your instructions, and the remaining two have not yet arrived. We regret that we cannot send you a favourable report on these grapes. The quality is not better than that of the grapes from Western Australia several years ago. Those in boxes marked No. 1 were packed in cork-dust. The berries were of mixed sizes, some very immature, all dull, stalks very weak, a little waste. No. 2 were

packed in paper; quality and conditions about the same; boxes a little smaller. No. 3 had no packing, the grapes being simply placed in the boxes. The fruit was very dull, and the condition bad. The proper packing is cork-dust simply, but no paper should be used at all, either white or brown: it simply heats the fruit. We regret to say that we do not think grapes of this quality would ever pay."

EXPERIMENTS IN POISONING THE FRUIT-FLY.

Mr. Despeissis, the Horticultural and Viticultural Expert of the Department of Agriculture, had his attention drawn to the alleged advantages in poisoning the Fruit-Fly as a means of checking that pest, and, in order to test the matter, arranged a set of experiments for that purpose. The first report is from Mr. Inspector Wickens, who writes:—

"I beg to inform you that at Woodbridge to-day, I endeavoured to test the efficacy of poison as a means of ridding the orchards of fruit flies.

"I half-filled three ordinary saucers with orange juice and dissolved cyanide of potassium in each, the quantities of poison used varying from a piece slightly larger than a broad bean, in the strongest solution, to one a little less than half that size, in the weakest.

"I placed the saucers in baskets and suspended them from the limbs of an orange tree on which a great number of fruit flies could be seen.

"I then cut in two several oranges and quinces, dipped the pieces in the poisoned mixture and hung them on the tree. As a further experiment, on the freshly cut surfaces of some of the quinces used, I rubbed a piece of cyanide, allowing the juice of the fruit to dissolve the poison.

"On closely watching results, I found that, although the flies hovered around the saucers, only a small percentage consumed enough of the mixture to become poisoned. The saucer containing the strongest solution was the most effective, and that was only responsible for five flies.

"With reference to the poisoned quinces and oranges (dipped). noticed that while the fruit was moist with the mixture, the flies were not at all eager to alight on it, but as soon as it became dry,

they settled on, walked over, and apparently sucked up the juice from underneath the poisoned surface, without any damage resulting to their constitutions.

"In only two instances I observed the flies die after settling on the poisoned fruit—one in about five seconds after touching the poison, the other fully a minute afterwards—and in both cases the fruit was moist.

"I also tried somewhat similar experiments on another tree, using arsenic instead of cyanide, but with hardly as good results even as with the cyanide. In no instance did I notice a fly die after settling on the arsenical mixture, though a few were caught in the poisoned juice.

"From careful observations made during the day, and after repeatedly noticing how readily the flies congregate on freshly cut fruit in its natural state, I have come to the conclusion that poisoning would prove extremely beneficial if some mixture could be obtained that would not interfere with the taste or smell of the fruit, but at the same time contain sufficient poison to destroy the insects. The mixture would need to be deadly, in small quantities, because the fruit fly does not appear to be a ravenous feeder.

"I might mention that the odour of cyanide was very noticeable, much more than that of the fruit juice in which it was dissolved.

"My reason for using oranges and quinces was due to the danger that might possibly arise of bees being attracted if sweeter fruits had been tried. To conclude, I am emphatically of opinion that the experiment is worthy of a further trial."

In reply to this report as to how the poison could be presented in a more attractive form, Mr. Despeissis writes:—

"'Scrub Exterminator' is the poison used by the Queensland experimenter. That substance consists mainly of arsenic, which, being odourless and tasteless, should prove a suitable poison for that purpose.

"The cyanide of potassium would, I have no doubt, be quicker in its effect. In Mr. Wickens' experiments, the cyanide of potassium in the presence of the acid fruit juice would evolve hydrocyanic acid gas which, on account of its peculiar smell, would not tend to attract the flies. This could be counteracted by neutralising a strong solution of cyanide of potassium by means of an alkali such as soda, potash, or ammonia. I shall have some fruit juice poisoned, and we will pursue the experiment."

Since the foregoing was written Mr. Despeissis has tried further experiments, which are reported as follows on the 10th of June :—

"A few days ago, in company with Mr. T. Hooper and Mr. Whittington, I tested poisoned fruit juice for killing fruit flies at Woodbridge.

"The season, however, is too far advanced for a successful trial of that method of destruction, and we had to wait from 9·30 to 11 o'clock until the flies got warm enough to come out.

"The test was carried out on a mandarin tree where fruit flies were known to be. Some fruit and leaves were smeared with fruit juice poisoned with arsenic and with corrosive sublimate."

The experiment demonstrated that—

(1.) Fruit flies are readily attracted by the smell of fruit juice. They had one suck and then flew away and we had no chance of watching the effect of poison on them.

(2.) Other flies—such as house flies, blow flies, and syrphus flies (a beneficial insect)—were likewise attracted and on these we had an opportunity of watching the effect of the poisoned juice (arsenic); they became very sluggish, crawled upon the twig where they alighted, and soon after dropped down dead.

This method of poisoning it is thus seen reaches both friends and foes, but would, nevertheless, be more beneficial than harmful in its results. In order to be reasonably successful strong doses of poison would have to be used in the fruit juice, and the poisoning would have to be done at a season of the year when the flies are both active and numerous.

We will, next summer, further try this method of checking the fly which, in conjunction with others, might do some amount of good.

TRAPPING DINGOES.

In a report from Mr. Ross, who is now in the Northampton district trapping dingoes, he states that at Wittereany Thicket he caught and killed five dingoes, and Mr. Brand, who lives in the district, caught two; Mr. Mitchell also caught one. Both these people set their traps according to instructions given them by Mr. Ross. Good work is being done in giving practical instructions to the settlers, who, in a number of cases, have been successful in capturing these pests which have in the past, caused so much trouble to their flocks.

THE POULTRY SECTION AT SHOWS.

By FRANK H. ROBERTSON.

The poultry societies are now holding their annual shows in quick succession in several parts of the State. The first to commence the season was the one held at Perth on 1st and 2nd July. It was a splendid exhibition, and far exceeded any previous show held in Western Australia, both as regards quality and number of entries. The exhibitors and also the attendance was composed of persons deeply interested in poultry-raising, but who are not engaged in making a living on the land. The farmer was not there. His opportunity will occur later on, when the agricultural societies are holding their shows; but there are poultry shows now arranged as follows, which all farmers within fairly easy access of would do well to attend, viz., Albany, 3rd and 4th August; Gingin, 24th August; Bunbury, 17th and 18th August; Leederville, 12th and 13th August.

The poultry section is, however, very badly managed at most of the country agricultural shows. The chief fault is in the manner in which the birds are shown. The general custom is for each exhibitor to find his own coop; the consequence is that exhibits are put into the first empty box available, which in many instances is far too small. At one show last year I saw some birds crammed into butter boxes; the birds could not stand, and as the day was warm the greasy sides of the wood oozed melted butter and made a great mess of the fowls' plumage. Other exhibitors had so securely battened in their fowls with broad boards that they were hardly visible, and in some cases birds were left all day exposed to the hot sun, crammed in these miserable boxes, panting and exhausted from heat and cramped limbs. Exhibitors should not be asked to find their own coops; either proper pens should be permanently erected under cover, or the regulation iron folding coops can be hired from the Perth Poultry Society, if applied for early; or better still would be to follow the example of the Geraldton Agricultural Society and have their own iron coops. They are expensive, but if the best off societies had their own coops, they could be hired out to the smaller societies in the same districts. Committees which intend taking steps in this direction should make their arrangements early, as coops take some time to make.

The classification at most shows is also very bad. The general custom is to make the prizes for pairs of fowls. This is quite wrong; the better plan is to make it for single birds, viz., for the best cock or cockerel in each class, and for the best hen or pullet. It means more entrance fees, better competition, and much more

satisfactory judging, as one person may have a very good male bird and a poor hen, and a rival exhibitor the other way about, but with the single bird system all this trouble is avoided.

Then again, the classification is often faulty, especially in the cross-bred and table classes. Cross-bred classes should be entirely omitted, except for table fowls, which might be, say, one for the four best cockerels, and another for the four best pullets, both for the table, either pure or mongrel, not for size only, but age and quality of flesh to be considered; if cross-breds, the cross to be stated.

The following would be an acceptable classification for the schedule of most country shows, viz.:—

1.	Langshan	Cock or cockerel
2.	Do.	Hen or pullet
3.	Game, any variety, including Malays ...	Cock or cockerel
4.	Do. do. do. ...	Hen or pullet
5.	Orpington, any variety	Cock or cockerel
6.	Do. do.	Hen or pullet
7.	Hamburgs, do.	Cock or cockerel
8.	Do do.	Hen or pullet
9.	Spanish or Andalusian	Cock or cockerel
10.	Do. do.	Hen or pullet
11.	Minorcas	Cock or cockerel
12.	Do.	Hen or pullet
13.	White Leghorn	Cock or cockerel
14.	Do. do.	Hen or pullet
15.	Brown Leghorn	Cock or cockerel
16.	Do. do.	Hen or pullet
17.	Plymouth Rock	Cock or cockerel
18.	Do. do.	Hen or pullet
19.	Silver-laced Wyandotte	Cock or cockerel
20.	Do. do.	Hen or pullet
21.	Golden-laced Wyandotte	Cock or cockerel
22.	Do. do.	Hen or pullet
23.	Any other colour Wyandotte	Cock or cockerel
24.	Do. do.	Hen or pullet
25.	Any other variety of Fowl not previously mentioned	Cock or cockerel
26.	Any other variety of Fowl not previously mentioned	Hen or pullet
27, 28.	Table Poultry, as already specified ...	Two classes
29.	Turkey	Gobbler
30.	Do.	Hen
31.	Pekin	Drake
32.	Pekin	Duck
33.	Indian Runner	Drake
34.	Do. do.	Duck
35.	Muscovy	Drake
36.	Do.	Duck
37.	Best Pair of Ducks for the Table	
38.	Gander or } Any Variety, single bird	
39.	Goose	
40.	Selling Class, not to exceed 20s. each, and exhibits can be claimed at price stated	Cock or cockerel (any variety) Hen or pullet (any variety)

The prizes could be given on a graduated scale, according to the number of entries, of which the following is an example:—

(SINGLE BIRDS ONLY).

Entrance Fee, 2s. 6d.

PRIZES:

One Entry	... 2s. 6d.
Two Entries	... First, 4s., Second, 2s. 6d.
Three Entries	... First, 5s.; Second, 4s.
Four Entries	... First, 6s.; Second, 4s.; Third, 2s.
Five Entries	... First, 7s. 6d.; Second, 5s.; Third, 3s.
Six Entries	... First, 10s.; Second, 5s.; Third, 3s.
Seven Entries	... First, 12s.; Second, 6s.; Third, 4s.
Eight, Nine, or Ten Entries ...	... First, 15s.; Second, 7s. 6d.; Third, 5s.
Eleven, Twelve, or Thirteen Entries	... First 17s. 6d.; Second 10s.; Third, 7s. 6d.
Fourteen (or over) Entries ...	... First, 20s.; Second, 15s.; Third, 10s.

Special prizes could be given for the exhibitor making the largest number of entries. Another special could be given for the best bird in the show.

All exhibits should have a price on them at which they can be claimed; any exhibitor not wishing to sell could put a prohibitive price on his exhibit, such as £10 or £20.

All sales to be done through the secretary of the society, and a commission charged.

In ticketing the exhibits, the information given should be the number of the class and the number of the exhibit, which should continue to the end of the exhibits and not terminate at each class, also the price at which the owner is willing to sell.

In hiring show coops tressels and floors have to be provided, and the coops should be set up the day before the show, as they have to be unfolded and tied together with string, which takes a little time; if timber is not available for the floors, sheets of galvanised iron will answer.

Now a word to exhibitors. In the first place, all fowls intended for the show should be caught a few days before the event and kept in open-fronted coops, and handled frequently, so that they will be tame when meeting the eye of the judge, as fowls very often refuse to show themselves when placed in the exhibition coop, if taken straight off a free run. White fowls, to look well, should be washed. This is done in the following manner:—First thoroughly saturate the bird in a tub of luke-warm water; take some time over it, and make sure that the plumage is wet to the

skin; then thoroughly wash the fowl with soap in another tub of warm water; scrub the feathers well to get out all dirt, then immerse the bird in another tub of cold water, and get out every particle of soap; if this is not well done the washing will not have made much improvement; and finally, if the plumage is not sunburnt, a little washing blue may be added to the water, and with a sponge absorb as much water as possible; then dry the bird in an open basket in the sun, if a warm day; if not, this must be done before a fire. The only preparation birds of other colour require is to wash the legs, comb, face, etc., with warm water and soap.

FARM NOTES.

By F. L. FAULKNER.

Farm work for this month will be largely a repetition of last. Seeding should be all done with. Summer crops should be well under way, and in the early districts the fallowing should be well on. Having noticed the very large proportion of land that is ploughed up, harrowed, and sown in a hurried, anyhow style, I must impress upon farmers the necessity of paying attention to thorough cultivation. Land that is intended for wheat should, to give the best results, be all ploughed six or seven months before it is required to start sowing. That is, fallowing should be all done and finished by the end of August. This land, whether summer cropped or kept as bare fallow, should be kept free from weeds and with a fairly mulchy surface, during the summer, with harrows and scarifier. Then, as soon as the first good rains come, the drill can be put to work without delay, preceded by the harrow or cultivator, as is thought best. In this manner the farmer is able to get a very much larger area under crop quickly and well, and with a smaller plant than if he has to do his ploughing after the rainfalls. The price of wheat in this State will almost undoubtedly be low, and to make farming pay under these conditions the farmer who is to succeed must have good crops and large areas of it.

Farmers who keep sheep should now be paying as much attention as possible to their breeding ewes. A good paddock of feed should have been reserved for the lambing season, and plenty of shelter or a belt of thick timber or scrub should be provided.

Care should be taken that the ewes have got plenty of good feed, as the production of good quality lambs is one of the most profitable industries in farming. Good fat lambs are always sought after, but mediocre and poor are never in much demand.

Poultry at this time of the year require plenty of attention. Pens for breeding should already be supplying eggs for setting and incubator purposes.

Pigs—very profitable consumers of rough grain, sproutings, etc.—should be supplied with good warm shelter, but at the same time should have access to a good grass run. Dry sows thus treated will be found to cost very little for their keep, but, of course, a sow suckling a large litter must be always well-fed.

Farmers should pay attention to the housing and care of their implements. I think I am safe in saying that on many farms machinery is damaged more by rust and decay than by the actual work done by it.

Machine sheds may be made very cheaply and effectively, and I think the best style of them all is a long shed with the back to the weather, the ends closed in and the front open, being just broad enough to shelter a waggon backed into it.

A shed thus made, and with rails or doors across the front to keep stock from the machinery, will, I am sure, soon repay its cost in the saving of machines.

EAR-COCKLE IN WHEAT.

By RICHARD HELMS.

Several complaints of the prevalence of ear-cockle in some of the farming districts in this State having been made to the Department, it has been considered advisable to republish the following article from the earlier issues of our *Journal*. The importance of taking stringent measures to eradicate this grain pest, which is really a minute nematode or worm, cannot be over-estimated. Farmers should be particularly careful in purchasing seed, and not have it on any consideration if it shows signs of cockle.

Where it has already got a hold, the land should be left for grazing purposes as long as possible, and fallowed well before re-cropping, or the crops may be changed, and instead of growing cereal or any grass crops, peas, beans, roots, or crops of a similar nature will be found to be immune from the effects of the cockle.

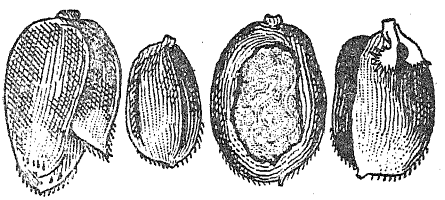
"Owing to the re-appearance of ear-cockle, it is thought desirable to republish the following article, which appeared in the *Producers' Gazette* some time ago:—

"A few months ago some diseased ears of wheat were sent to the Department, which appeared, from the minute spots on portions

of the chaff, to be attacked by a fungus. The ears were well developed, and otherwise normal in appearance, but, instead of the usual golden seeds, contained irregularly-shaped, dark-coloured, shrivelled grains, about $\frac{1}{8}$-inch long. On closer examination, these grains were found to be the galls formed by a nematode, a minute semi-transparent worm, that is well known to have caused considerable damage to wheat and other cereals in several parts of Europe and America, and which also occurs in the other Australian colonies.

"The disease is variously known as 'ear-cockle,' 'purples,' 'peppercorn,' or 'false ergot,' and Dr. Cobb (*Agricultaral Gazette* of New South Wales, vol. I., p. 173) refers to it as "gouty" wheat grains.

"The nematodes by some means reach the newly-formed ear, and, by attacking the reproductive organs and ovary, greatly damage these or entirely destroy them. In consequence no seed is formed, but in its stead a gall is produced, which serves as a shelter for the young worms. When fully developed, the gall is brownish or purplish black, and very hard. Its wall is constructed of hexagonal cells, and comparatively thick, and encloses a white fibrous substance. This matter is composed of an incredible number of minute nematodes, closely coiled together, and interspersed with a little white powdery substance which is considered to be gluten.



Galls of "ear-cockle from wheat spikelet, with portion of wall from one split off to disclose accumulation of worms. Enlarged five diameters. (After Smith.)

"By crushing a gall and placing it in a watch glass or other glass vessel, with about half a teaspoonful of clear water, its contents will dissolve in a milky flocculent substance, the greater part of which, when the vessel is gently shaken, or the mass spread with the point of a penknife and held over a dark surface, appears like short pieces of fine wool. These are the worms, which, in about 10 minutes more, may be seen to move in a slowly undulating manner.

"The number present will be found enormous. I lifted a drop of the water charged with these worms, and under the microscope counted over 500 in it. From this revelation I feel convinced that, on an average, each gall contains more than 5,000 nematodes. Such numbers prove the surprising fecundity of these minute creatures, which in the mature state reach only a length of scarcely more than $\frac{1}{8}$-inch; but, astounding as their reproductive powers may be, the wonder is still surpassed by the extraordinary tenacity of life possessed by them.

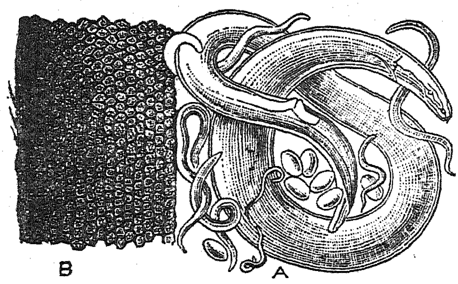
"Dr. Bastian described the worm under the name of *Tylenchus tritici*; Schneider named it *T. scandens*; and Needham, *Anguillula tritici*.* The first name is the one generally adopted.

"The life history of the creature and the method by which it reaches the ears is not definitely known. Curtis † states:—'The eggs are taken up by the sap from the infected grain which may have been planted, and hatch in the stalk as well as in the germen.' This seems to me to be an untenable hypothesis, as the 'ear-cockle' cannot germinate, it not being a seed, but a gall—a mere shell, containing a ball of worms and a little gluten.

"Smith ‡ says:—'Various observers have artificially infected wheat with the *Tylenchus* by placing the living nematodes taken from a gall in the furrow or cleft of a grain, and then planting the infected seeds in the soil in the usual manner. Or galls may be planted in close contiguity with healthy grain. After a brief time the nematodes will work their way through the wall of the softened and decaying galls, and come naturally in contact with the young leaves sprouting from the healthy seed. The nematodes then insert themselves between the sheaths of the leaves, gradually working their way round till they come to the innermost, where they remain till the rudiments of the future ear begin to form.'

"Although the wandering of the minute worm in the manner described is long and circuitous, this theory seems best to explain the creature's presence in the ear, which apparently it requires to reach in order to propagate its race, and where, in affected plants, it may always be found soon after the terminal shoot has begun to form.

"It is uncertain whether the worms copulate on their way to the forming ear, or after attacking the sprouting inflorescences, and by their aggression have induced the adventitious growth which constitutes the gall; but it is evident that the parents die after depositing their eggs, and that the occupants of ripe galls remain in the larval stage until they are released and enabled to obtain food for their further development.



A. Portion of colony of nematodes in various stages from the egg.
B. Fragment of wall of an "ear-cockle." Enlarged 40 diameters. (After Smith.)

Tylenchus, from the Greek of *tylos* a knot, knob, and *enchos*, spear, in allusion to the shape of the galls formed by the agency of these creatures, and the pointed prolongation possessed by them behind, known technically as "spear": *tritici*, Latin, belonging to wheat; *scandius*, Latin, climbing; *Anguillula*, Latin, small eel, from Anguilla eel.

† *Farm Insects*, by John Curtis, F.L.S.

‡ *Diseases of Field and Garden Crops*, by Worthington G. Smith, F.L.S., etc., London, 1884. This valuable work was kindly lent me by D. McAlpine, Esq., the Government Pathologist of Victoria, to whom I am also obliged for other assistance. I embrace this opportunity to acknowledge my gratitude.

"Unless the worm attains maturity and reproduces itself, its life may remain suspended for an indefinite period, and even when released from its covering and awakened by the application of water it may, without being destroyed, relapse into a dormant state again at the withdrawal of the moisture. 'Dr. Bastian specially adverts to the tenacity of life belonging to the species found under the genus *Tylenchus*, and he attributes that vital tenacity in part to the structure of the integument of the animals. This integument is of such a nature that it enables the nematodes to resist desiccation, and prevents the evaporation of moisture through their tissues. The power of remaining in a dormant, deathlike state for a long series of years Dr. Bastian attributes to some inherent peculiarities of the animal's tissues beyond the reach of detection by optical instruments of even the highest power. The same author says it is an established fact that *Tylenchus tritici* is capable of resuming activity after remaining dormant for 27 years.' *

"Even after the larvæ, being released from the gall, have been brought to activity in water, they do not die when allowed to become dry again.

"'For five years and eight months Mr. Brauer was able to re-animate the worms by immersion, but it required a longer period as the time lengthened, and after that they died. Other examples bred by him retained their revivescent qualities for six years and one month. . . . They may be kept alive for three months in water.' †

"My own experiment confirms the tenacity of life of this creature, after a severe test. The contents of a gall were animated in a little water and then placed near a window, where, for ten hours daily, they remained exposed to the blazing sun. The water dried up in less than half an hour in the shallow dish and the worms were left, thinly spread, sticking to the flat bottom of the vessel. After 18 days' exposure I moistened the dish towards night, and on the following morning found the worms actively wriggling.

"Considering the great fecundity of these worms, and the extraordinary tenacity of life possessed by them, their destructive powers may become severely felt unless due precautions are taken against the spread of an invasion. No doubt the difficulty they have in finding a food plant and then reaching the ovaries of the cereals militates against their aggressiveness, as it is evident that by far the greater number of the nematodes must succumb after the walls of the gall have decayed, and that only a very small proportion are able to attain the goal in which to perpetuate their race. It is well that it is so, or the production of cereals would soon become impossible, for it has to be borne in mind that, in addition to wheat, rye and oats, as well as several kinds of meadow grasses, are subject to their attacks.

* Smith, *loc. cit.* † Curtis, *loc. cit.*

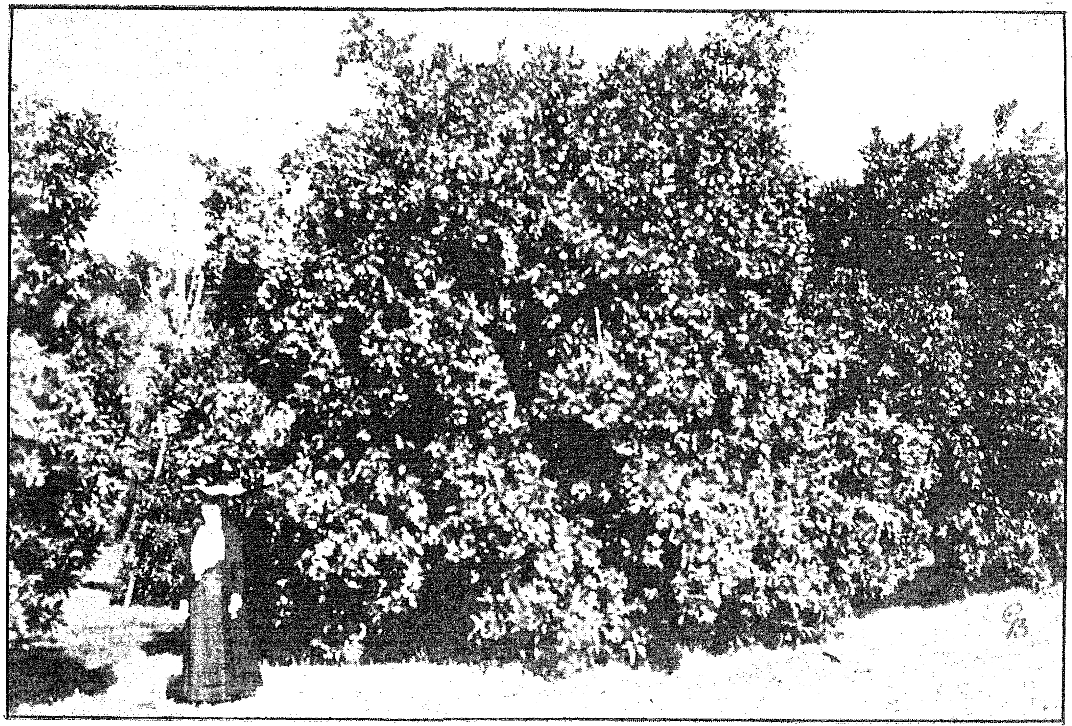
"If infested land is allowed to remain fallow for a few years and used for grazing, it becomes free from nematodes, and this seems to be the best remedy against them; or, by alternating the crops and sowing pulses or planting potatoes, which are unsuitable food plants, the same object may also be attained. It is very probable that some natural enemy destroys the worms when they emerge from the gall, otherwise their disappearance could not be accounted for, considering their otherwise extraordinary retention of vitality.

"But too great care cannot be taken not to sow the galls with cereals. This can easily be avoided, as they are readily recognised by their dark colour; and being much smaller than most grains, except rye, they will pass through a sieve with proper meshes. All galls should be carefully gathered and burnt, and, if mixed with broken or small grain, this should be boiled before it is used for food.

"From wheat, which always should be steeped to prevent fungus growth, the galls may also be separated if the 'pickle' is allowed to rise above the surface of the corn and the corn be stirred. This manipulation will allow the lighter 'cockles' to ascend and float on top, when they may be readily skimmed off.

"Remembering the enormous number of worms a single gall contains, the destruction of every specimen cannot be too determinedly insisted upon.

"In conclusion, it may not be out of place to draw attention to a noxious weed, the *Lychnis Githago,* also known as 'corn-cockle,' the seeds of which are black, and superficially resemble the 'ear-cockle.' As this weed occurs in parts of the other colonies, it may at any time find its may to Western Australia. Both the names as well as the resemblance between the gall and the seed readily lead to confusion, and although of the two the weed is considerably less objectionable than the nematode, it nevertheless would be a very undesirable introduction, and should be vigorously suppressed on its first appearance."



"King of the Garden"—Grown at Mr. J. Butcher's Orchard, Kelmscott. (*See letterpress.*)

EXHIBITION OF COLONIAL-GROWN FRUITS, DECEMBER 13 and 14, 1904.

The following circular has been received from the Secretary of Royal Horticultural Society, 117 Victoria Street, London:—

"I send you herewith a copy of the schedule recently issued for the Autumn and Winter Shows of this Society. On page 33 you will see that the Society proposes to hold an exhibition on December 13 and 14 next of Colonial-grown fruits, both fresh and preserved, or dried or bottled.

"This new departure has only been rendered possible for the first time this year, by the completion of the Society's new Centennial Hall in Vincent Square, Westminster, and the council are consequently especially anxious to make the exhibition a success, and that it should worthily represent our Colonies.

"Would you, therefore, let me know how best I may make it known in your Colony. I have sent the schedule to 100 Colonial newspapers, in addition to the Press at home, and if you would oblige by sending me the names of any prominent shippers, importers, or growers who you think might be likely to exhibit, I should be glad to send them schedules direct, or I would send you any number for distribution.

"If desired, the society's own officials will unpack and stage exhibits provided they arrive in good time, but the Society cannot undertake to repack and return. No charge is made for space. Opportunity will also be afforded for each Colony to make a collective exhibit in addition to individual entries. Decorations of such exhibits should, as far as possible, be confined to plants and foliage representative of each Colony.

"An exhibition of jams and of dried, bottled, and otherwise preserved fruits will be held at the same time, which will be open to Home, Colonial, and Foreign produce in separate classes.

"A Press view will be held on Monday, December 12th, from 5 to 8 p.m., and the exhibition will be open to the public from 10 a.m. to 10 p.m. on Tuesday and Wednesday, December 13th and 14th. The goods being cleared away on Thursday, December 15th.

"If you could further introduce me to anyone who would deliver a lecture or contribute a paper on fruit-growing in the Colonies, or some kindred subject, I should be glad. Our new lecture room is being fitted with an excellent electric lantern, and every modern facility for the effective reading of papers."

ALMOND TREE—NOT BEARING.

"Will you please inform me in your inquiry column for July what is the reason the almonds on my tree fall off every year?

"I have but one almond tree in my garden—a Jordan. The nuts seem to set beautifully, but after a few weeks they wither and drop off. In three years not an almond has reached maturity."

The matter being referred to the Horticultural and Viticultural expert, Mr. Despeissis replies as follows:—

A variety of causes may individually or collectively bring about the trouble complained of, viz.:—(1.) Unsuitable stock for either the soil or the kind of tree. (2.) Cold, windy springs. (3.) Lack of some essential element of plant food in the ground, such as phosphates, lime, potash, nitrogen, etc. (4.) Bad drainage or accumulation of wet about the roots.

A WELL-GROWN ORANGE TREE.

The illustration, showing the good growth and heavy-bearing orange tree, is from a photogram taken a few days ago at Mr. Jas. Butcher's orchard, Kelmscott. The place is in the occupation of Mr. Cross, who states, in reference to the orange trees:—

"About 30 years ago an orange was bought in Perth for 4d. The pips of this orange were planted, and two trees were obtained and planted near the river, on Mr. Butcher's farm, Kelmscott. All the trees on the place were obtained by layers from these two. At their third year from planting out they started bearing—some 16 years ago—and have done so up to the present day.

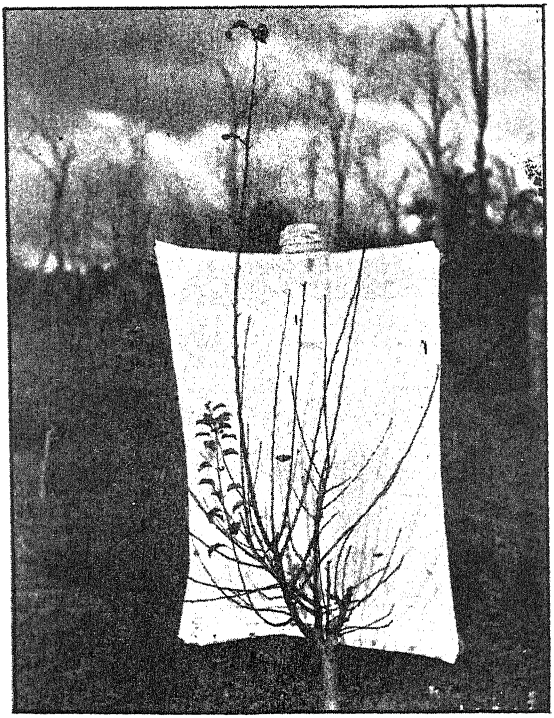
"There are 50 trees in the two rows, and every other year they bear a very heavy crop. It is estimated to pick 1,000 cases this year of a good uniform size.

"The trees average about 25 feet in height, and measure 19 feet in diameter. The soil is of a sandy loam, and has an old river bed.

"The trees are healthy in appearance, and are almost free from any disease.

"The illustration shows a photogram of one of the original trees, and known as the 'King of the Garden.' It is estimated that there are at least 500 dozen oranges on it this year."

While it is pleasing to see such luxuriant growth, it would be far better if the trees were thinned out and liberally manured. The grower would get finer and heavier fruit, and so command a better price than for those grown at present.



Die-back in Apple Trees.

(The right hand side shows the stunted early growth, that on the left late vigorous growth.)

"DIE-BACK" DISEASE: INVESTIGATIONS INTO.

The following report was sent by Mr. Despeissis, the Horticultural and Viticultural Expert of the Department, to the Acting Director of Agriculture:—

Further investigations into this destructive disease have strengthened my views that the trouble lies at the roots of the tree.

A few weeks ago I planned out a series of experiments with the view of finding out whether—

(1.) By increasing the fertility of the soil,

(2.) By methods of cultivation tending to preserve surface root growth,

(3.) By removal of diseased branches,

(4.) By spring sprayings to guard against infection,

the disease could not be overcome.

I have since abandoned these experiments in the orchard selected—one typical of many others where this trouble is common—on account of the conclusions which a preliminary investigation enables one to draw with regard to the primary cause of the "die-back" of a great many of our fruit trees.

In the orchard where I intended carrying out the experiments, a plantation of young apple trees have for several years been going from bad to worse.

The history of the affected trees is as follows:—

The land, which is situated in one of the valleys of the Darling Ranges and originally under jarrah, white gums, and black boys, was cleared seven or eight years ago; the apple trees were hurriedly put in, each variety in a row. For the first two or three years they all grew very well, then by degrees commenced to die back in the spring, recovering in the late summer and early autumn.

They were freely sprayed for the apple scab *(Fusicladium)* with Bordeaux mixture and well cultivated, but without any satisfactory result.

The block of trees is on a gentle slope, the ground of which is a brown loam some seven to nine inches deep. On examining the trees some rows (King of the Pippins for one) are seen less affected

than others, although few or none of the trees appeared in good health. They have little hold in the ground and can easily be shaken about. When digging a circular trench two spits deep, 18 inches from the stem, very few roots were cut by the spade.

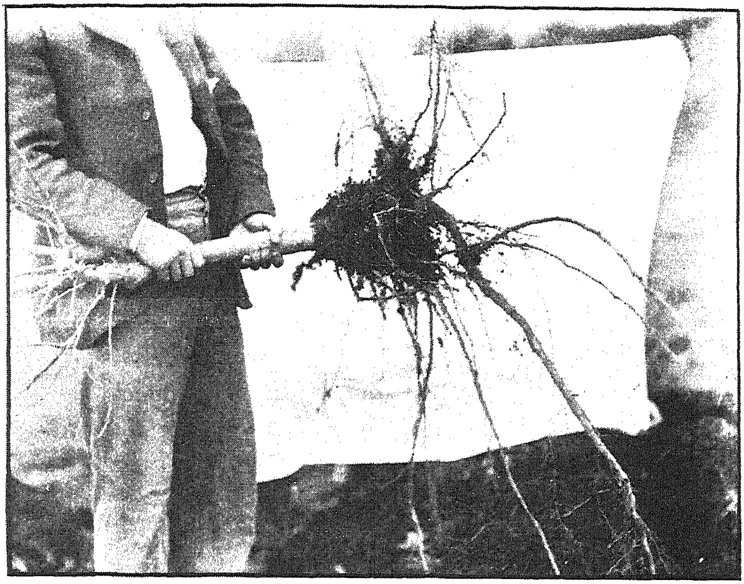
A slice of the top soil, four inches deep, was removed and no roots were found growing in it, except short bunches of fibrous roots just around the stem. That soil was rich and showed evidence of previous generous manuring with lime and bonedust. The only roots the trees had, were met with from a depth of about four inches from the surface to a depth of about 10 to 12 inches. There were no tap roots and the trees could be lifted out of the ground without any effort.

A deeper examination of the ground showed fair soil to a depth of about 18 inches from the surface; below there is a hard compacted layer of sand and clay mixed, light in colour, and in the winter sodden with water. No roots could penetrate that subsoil.

The owner is satisfied that the trees have been carelessly planted on badly prepared ground; that it is unsuitable for apple-growing. He is going to root up the block and grow a crop of peas and replant next year with pears. It is reasonable to expect that better success will then be experienced. In instances of this sort especially, it is more necessary to suit the class of trees to the kind of soil, and pears are hardier than apples. A greater measure of success still should be met by planting pears worked on quince stock, or at least those varieties which do best on that sturdy root. The resulting trees being dwarfs in comparison with the larger pear trees will require less feeding ground.

The illustrations show a typical tree affected with the "die-back" disease. The leading branches have been cut back at pruning time, and one, a strong limb, has, in the spring, hardly shown any sign of growth, a few twiggy branchlets have reluctantly grown around it. The other leading branches show the same stunted growth to a lesser extent. Late during the growing season a bunch of roots has pushed forth into the shallow soil, cold in the spring, and a corresponding vigorous branch has shot up, which is shown in the photogram.

The second illustration shows the narrow zone of growth and the spreading direction of the roots and rootlets, and the absence of any root with a vertical growth.



Die-back in Apple Trees, showing root system.

BOTS IN HORSES.

A correspondent writes:—"Having recently lost a valuable imported draught mare through bot fly, and fearing that another of the team is showing incipient symptoms of the same dread pest, I beg, through you, to ask the Government Veterinary Surgeon for advice as to treatment, signs for diagnosis, period of incubation, etc., before the death of the horse ensues, and any other general information that will enable me to escape further serious loss from one of the most deadly causes of mortality among horses in the South-West. Awaiting the favour of as early a reply as may be convenient."

The matter being referred to the Chief Inspector of Stock, Mr. Weir replies as follows:—

There is no effective cure for bots when once they become adhered to the walls of an animal's stomach, and it is impossible to prescribe a remedy which will cause them to relax their hold without impairing the health of the animal itself. The following powder may be given with safety, and at the same time will probably assist in destroying the parasites:—

Sulphate of iron	1oz.
Sulphate of copper	1oz.
Tartar emetic	1½oz.
Arsenic	1 drachm.

This compound should be divided into 12 powders, and one given in a mash of bran and chaff twice daily. On the 14th day, after the animal has been prepared with mashes, an aloetic physic ball of seven drachms for a draught horse will require to be administered. Nourishing food should be given after the physic has acted, and the animal's condition improved as much as possible.

During autumn, or the latter part of summer, when the bot fly lays its eggs on the chest, jaws, and knees of horses, a careful examination of all horses should be made, and if any of the white eggs are found adhering to the animal they should be clipped off, or removed by means of a solution of kerosene, hot water, and soap, or an ointment of kerosene and lard rubbed on to the parts. The usual life of the bot in its parasitical stage, which is passed within the alimentary canal, is about six months, when it then passes out, and in due course develops into the fly.

BEE-KEEPING FOR SMALL FARMERS.

By W. BROUGHTON CARR, Editor *British Bee Journal.*

(Continued.)

Pre-supposing, then, that the "conditions" already named as being "indispensable" are favourable, that the few hours of preliminary reading prescribed have been gone through, and that our farmer friend has resolved upon making a start with bees, a suitable part of his little farmstead must be selected whereon to locate the hives. It should be as far away from public highways as possible, and, if convenient, in a quite place, sheltered from high winds, where the bees are not likely to be interfered with by men or animals. The hives must be securely fenced off, if situate on land where cattle are accustomed to feed. They should also be not so far away as to prevent those engaged about the dwelling-house from seeing when swarms are in the air. If the hives can be so placed as to afford a free bee-flight towards the open country, while the bee-keeper has room to work at the side or in rear of them without interfering with the flight of the bees, it is mutually advantageous to them and to the bee-keeper.

One of the most reliable arguments in favour of combining apiculture with small farming lies in the fact that the bee-keeper can time his work so as not to interfere unduly with the attention needed for harvesting his ordinary agricultural produce. Moreover, much valuable help can be rendered by a farmer's wife who is so disposed, and many instances are recorded in which women make most successful bee-keepers, when helped by their husbands in the merely mechanical labour of hive-making and such manual work as is suitable for men only.

Another item for serious thought is the outlay involved in providing the necessary appliances and stock required for the work of a small apiary. Certain of these things must, perforce, be purchased; among them, in addition to hives, we may include sections, frames, comb-foundation, honey-extractor, bee-smoker, super-clearers, and possibly a few syrup-feeders; but the main point is whether or not our small farmer possesses sufficient mechanical skill, combined with the needful inclination, to make his own hives during the long winter evenings when out-door work is out of the question. That many men—gardeners, artisans, and others who can handle joiners' tools very well—do this is certain, and if we may include among them the farmer who starts with bees, the initial outlay will be of course considerably reduced; but he must always bear in mind the importance of accuracy in measurements, seeing that it is absolutely essential for efficiency in working that

roofs, lifts, floor-boards, surplus chambers, and all the various loose parts of hives be interchangeable with each other.

It is certain, however, that many will, for some reason, either be unable to make their hives or prefer to purchase, and to these we say, do not on any account be persuaded to adopt a hive that is not made to take the "standard" frame of the British Bee-Keepers' Association. In urging this precaution we refer only to the internal dimensions of the hive's brood-chamber or body-box, and to the *outside* measure of the frame. Thickness of top-bar and width or strength of side and bottom bars are of less moment and may be left to individual preference, but the outside measure of the frame must be 14in. long by 8½in. deep. Before deciding on the "type" of hive to be used, a personal visit to a hive-maker of repute—or preferably to a Bee and Honey Show, where there is a large and keen competition among leading bee-appliance makers whose goods are on view—will be very useful. Then, after a choice is made, a few hives (only a few) may be ordered in the flat, ready for nailing up at home. Such a hive would, of course, not include surplus chambers, but would simply consist of stand, floor-board, body-box (fitted with ten or eleven frames), quilts, lift, and roof, and may be had in the flat at prices varying from about 6s. or 7s. upwards.

On the other hand, the man who decides to make his own hives should select the one he prefers, and purchase it from a good maker as a pattern from which to work. This will be found true economy, as enabling him to choose the best kind of wood for the purpose, and reducing the cost to that of material only, except for frames, which must be machine-made for accuracy, and which may be purchased in the flat, dovetailed, and ready for putting together, at less than one penny each.

Some bee-keepers, to whom the saving of cash means much, have constructed strong, useful hives good enough for all practical purposes—from such unpromising materials as used boxes, which latter cost only a few pence each.

An instance of this is recorded in the *British Bee Journal* of April 30 last year, where we find described in full detail, with working measurements of each part, a complete frame-hive (except for the surplus-chambers, in which honey is stored for removal when full). It comprises *stand, floor-board, outer-case, body-box,* (or brood-chamber), *lift,* and *roof.* These various parts were made from (1.) an egg box, (2.) a lobster box, and (3.) a "Quaker oats" box, the three boxes costing 1s. 1d. It would take up too much space to print the full particulars of construction and give measurements, but anyone interested may obtain the *Bee Journal,* referred to, from the office, 10, Buckingham-street, Strand, for three halfpence, post free.

Another important question for the farmer is how to prepare his bee-produce for market. We say this because the value of a good crop of honey is raised or lowered very considerably by the way in which it has been prepared for sale. In considering this

point it must be remembered that home-produced honey has to compete with the foreign article put up by the skilled packers of the edible goods which make up the attractive displays seen in tradesmen's windows. The honey prepared for market by the farmer's wife of twenty years ago would make a sorry show nowadays. The most luscious combs of honey cut from skeps and carried to market on a large dish, or the run-honey in a big brown jar to be baled into the customer's honey-pot, are things of the past. The business of marketing honey has undergone a complete change, and in this connection the useful part borne by the women-folk is more than ever conspicuous. The wives of our best bee-keepers to-day generally do most of the work of "glassing" and "lace-edging" sections of comb-honey, and bottling-off and labelling extracted honey for market, and do it well. In fact it is a task a woman excels at if once shown how it is done.

A visit paid to a good honey show is an object lesson in the up-to-date preparation of honey for market which our farmer friend and his wife should on no account miss, for it is of little use securing a good harvest of honey unless it can be profitably marketed.

The extracting and cleaning of bees-wax is also usually done by the bee-keeper's wife. It will thus be seen that a large part of the work is as well suited for feminine hands as for those of men.

Bees, like all other live stock, require attention on the part of their owners, but with regard to feeding they are altogether different from other stock, seeing that the food-stores they provide for themselves are in a great measure appropriated by the bee-keeper. On the other hand, neglect of the apiary means loss to its owner, and not seldom serious damage to neighbouring bee-keepers. We refer to the disease known as "Foul Brood" (or "Bee Pest"), to which bees are subject. Those who do not grudge the necessary trouble required in order to keep their bees healthy can do so, as has been proved by the experience of well-known men in the craft; but without care disaster is certain to follow.

In this and many other sections of our subject we must rely on readers seeking, in the pages of a text-book, for fuller details regarding such items of practical bee-management as have not been made sufficiently clear. It is impossible in a short paper to do more than indicate the work needing to be done, without detailing fully how to do it. Especially is this true with regard to foul brood, which, being an infectious disease, must be studied in order that the best method of treatment and the nature of the remedies recommended may be fully understood and the disease successfully coped with.*

Our few closing remarks may be devoted to a glance at the financial aspect of the case, for this is the main point to be

* Leaflet No. 32, on "The Treatment of Foul Brood," may be obtained free of charge on application to the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

considered. The question, "Does bee-keeping pay" has been made familiar by its frequency among those desirious of making a start, and the replies have, of course, been *pro* and *con*; but if the two indispensable conditions named at the outset are assured beforehand, we unhesitatingly assert that, for the small farmer, bee-keeping will pay well. The amount of capital required would in any case be less than for the purchase of a horse or a cow, while the percentage of profit would more than double that of any other department of the farm. In the case of a working farmer of small means, he can make a start with one or two hives without investing any appreciable capital at all.

The published reports from bee-men who keep an accurate account of income and expenditnre show that a good profit can be made; but in taking up bee-keeping as a purely business matter, it needs, as we have said, a good location. No imaginative statements have been made regarding what has been done by others. The facts are recorded in print, for week by week, in the *British Bee Journal*, we see depicted "Homes of the Honey-bee," photographed from life. British bee-gardens are shown with their owners at work in them, and the bee-men seen, in giving their experience, tell what the bees have done for them.

Need we say more than advise the farmers to see pictures and judge for themselves whether or not it is worth while to try if a few hives of bees on their farms will not add to their pleasure in life while appreciably adding to their income.

CO-OPERATIVE POULTRY SOCIETIES IN IRELAND.

The following interesting article on co-operation in the poultry industry is taken from *The Journal of the Board of Agriculture*, England:—

"In Ireland everyone keeps poultry. The cottager, be he labourer or artisan, keeps a few fowls on his half-acre plot, or, if he has not a plot, he keeps them on the roadside. The farmer of 300 acres, as well as the small holder of three to ten acres, is a poultry-keeper, and fowls are kept in the towns, the villages, the cities and the suburbs, by shopkeepers, artisans, professional men, and, indeed, by all manner of men or their wives.

"Perhaps this is the reason why so many public bodies are engaged in helping forward the poultry industry, but another equally good reason is to be found in the great demand which there is for poultry and eggs in Great Britain and Ireland. How-

ever this may be, it is certain that strenuous efforts have been made for some years past to develop the poultry business, and to establish the marketing of poultry and eggs on a sound commercial basis. The public bodies which have been, and still are, engaged in this useful work, are the Congested Districts Board, the Irish Agricultural Organisation Society, the Department of Agriculture, and the County Councils.

"In this article I propose to deal only with the work done by the Irish Agricultural Organisation Society, with which I have for many years been intimately connected as poultry expert and organiser, and of which I can speak with some authority.

"A description of the functions of the Irish Agricultural Organisation Society would require a special article, and I cannot in this short article say more than this—that the I.A.O.S., which is the familiar title in Ireland of the Irish Agricultural Organisation Society, is a body which was founded ten years ago by Sir Horace Plunkett and the Rev. T. A. Finlay, S.J., assisted by a committee of noblemen, business men, professional men, farmers, and others, who worked together on a strictly non-political and non-sectarian basis; and that the main object of the society thus formed was to organise and establish co-operative productive societies throughout Ireland. Some 800 co-operative societies have been formed, covering a wide and varied field. The same principles govern the organisation and the work of all our societies, viz., loyalty, trust, and mutual self-help. Amongst the industries which they embrace are dairying, agriculture, poultry-keeping, gardening, fruit-culture, bee-keeping, home industries, parish banks, boot-making, shirt-making, etc.

"Special experts were employed by the I.A.O.S. to organise and launch these various forms of co-operative societies, and after the I.A.O.S. had been engaged for some years in the formation of societies of different kinds, its attention was attracted by the possibilities of the poultry industry. It was seen that, in addition to the home supply, the people of Great Britain imported upwards of six million pounds' worth of eggs annually from foreign countries. The Irish supply was only valued at £2,000,000, and they were handled so badly and kept so long before being exposed for sale that the mere name of an Irish egg was something to sniff at, and many of the eggs themselves were used for manufacturing purposes and not for food. The I.A.O.S. has done much within recent years to increase the output of Irish eggs and to improve the quality, and, after English and French eggs, Irish eggs are now much sought after.

"The increase in the output of eggs and the improvement in qualitiy have been brought about through the medium of co-operative poultry societies, but it must not be supposed that the work of the societies ends here. As a matter of fact, it neither begins nor ends with that branch of the business which consists in handling and marketing eggs, but the operations of societies are

extended to the improvement of breeds of poultry, instruction to members through leaflet, lectures, and other means in the best methods of breeding, rearing and feeding poultry, and also to the fattening, handling, and marketing of all classes of poultry. In a word, I may say that anything which can be done to improve the condition of the Irish poultry industry is considered legitimate work for a co-operative poultry society.

"In order to give my readers a clear idea of the constitution and functions of our co-operative poultry societies, I think the best course is to take a typical society as a model and describe its constitution and its work. With this object, I have selected the Dervock Poultry Society, which is situated near Ballymoney, in county Antrim. Nearly all the photographs taken to illustrate this article were taken on the premises of the Dervock Society.

"This society was established in October, 1901, with a membership of about 500 and a paid-up capital of about £250. Since that time the membership has increased to 700, and the paid-up capital is now £350. The nominal capital is £700, so that it appears half has been called up. The nominal value of the shares is only 5s. each, and in order to become a member of the society it is compulsory to take at least one share. The purpose in fixing the value of shares so low as 5s. is in order that every person in the locality, rich or poor, may become a member by taking one share, but a scale has been laid down to regulate the number of shares which each member ought to take. The poor man, who keeps twenty-five hens or less, may join the society by taking one share, but the farmer who keeps one hundred hens must take four shares in order to qualify for membership. The scale is one share to be taken for every twenty-five hens kept. The 700 members of this society have taken, on an average, four shares each, so that the average size of the flocks may be taken at one hundred hens. There are many labourers who keep only twenty to thirty, but there are some farmers who keep 200 or 300.

"The society is a limited liability company, so that each member is liable only for the amount of his share or shares. It is governed by a committee of ten members, elected by the shareholders, and in the election of the committee every member has one vote only, whether he holds one share or more.

"Subject to the committee, there is a paid manager, who must be a thoroughly competent business man, and he is paid a salary in accordance with the business and success of the society. The manager of Dervock Society is paid £120 a year. The staff, in addition to the manager, consists of four box-makers and egg packers, two of whom are girls, and four collectors. These are busily engaged during the summer season in dealing with the egg business, but during the winter season they also work at the table-poultry business. The busiest season is immediately before Christmas, when some thousands of turkeys and geese are bought,

killed, and prepared for market, and it is necessary to engage extra workers, chiefly women, in order to deal with this special trade.

"The Dervock Society works over a comparatively large area extending to five or six miles from the centre in Ballymoney direction and up to twelve miles in other directions. The eggs are gathered by four collectors, who travel to the houses of all members regularly, and by this means freshness of the eggs are ensured. The collectors are paid partly by commission and partly by wages; a good portion of the district is worked by the society's own horse and cart, and this is found more economical than hiring other men's horses to do the work.

"The turnout in the egg department of this society is £6,000 per annum, which is paid for 2,160,000 eggs, having an aggregate weight of nearly 130 tons.

"The premises occupied by Dervock Society consist of: (1) office; (2) shed for box-making; (3) storage and packing-room, in which all work connected with the weighing, testing, grading, and packing of eggs is performed; (4) store-room for empty packing cases, straw, wood-wool, etc.; (5) stable, harness-room, and cart-house. These are situated in a convenient and central place adjacent to the railway station, and they are let to the society at a yearly rent of £6. The rent is low, but the buildings were not in good repair when they came into the hands of the society. They were simply some old buildings with a walled-in yard, which were taken by the committee and converted into suitable premises for the egg and poultry business.

"The plant and fittings were not expensive, considering the volume of work which is turned out. The following statement shows the approximate cost, and gives an idea of the money which must be sunk in the purchase of necessary stock and appliances when a poultry society of this kind is being started:—

	£	s.	d.
1 horse, value	20	0	0
1 spring van and set of harness	18	0	0
1 set of large scales	4	0	0
5 sets small scales at £1	5	0	0
1 set of books and stationery for office, stores, and collectors	6	0	0
1 set machinery for grading and testing eggs ...	7	10	0
Acetylene gas plant	10	10	0
20 boxes for collectors, at 4s.	4	0	0
1 set of tools for box-making, etc.	1	1	0
1 set of stencils	1	10	0
	£77	11	0

(*To be continued.*)

DALGETY'S REPORT.

STOCK DEPARTMENT.

FREMANTLE SALES.—We have to report a very good sale of store sheep (from Carnarvon) at our yard, here, on Thursday last, all of which were sold under the hammer, at the following rates:—468 wethers, large frames, fair order, at 19s. 6d.; 1,100 wethers, fair frames and condition, at 17s. 6d.; 374 mixed sheep, at 17s.

COUNTRY MARKETS.—We held our usual monthly sale at Narrogin on Wednesday, 20th inst., when we sold a good line of fat sheep at 28s. per head. Milch cows sold at up to £12, and draught horses up to £30. Fowls at 3s. 6d. per pair, and turkeys at 17s. 6d. per pair.

At our Katanning sale, on 22nd inst., there was only a small attendance of buyers, farmers in this district preferring to take advantage of the fine weather to finish ploughing and sowing operations. Draught horses realised from £25 to £33; light harness horses, from £10 to £15. Fowls sold readily at from 3s. to 3s. 7d. per pair.

At our York sale, on 29th inst., there was a splendid yarding of stock. Fat wethers realised from 24s. to 26s. 6d., a good line of ewes at 22s., and hoggets at 16s. 3d., and store ewes (low condition) 14s. Breeding sows, from £3 to £6; porkers, £1 1s. to £2 6s. Light draught horses sold at from £18 to £21.

During the week we disposed of a line of 900 hoggets, near Northam, at 16s. 3d. per head.

HIDES, SKINS, TALLOW, ETC.

Sheepskins.—These have been in smaller supply, and prices have improved nearly ½d. per lb. since our last report. Competition during the early part of the month was very strong, but a slightly easier tone was noticed at the last two sales, any change in values being in buyers' favour. Shorn pelts continue in strong demand, and sell readily at quotations:—Good merino, three-quarter to full wool, 7d. to 7⅜d.; medium, three-quarter to full wool, 6d. to 6⅜d.; good, quarter to half wool, 6½d. to 6¾d.; medium, quarter to half wool, 5d. to 5½d.; fine crossbred three-quarter wool, 6½d. to 7d.; fine crossbred half wool, 5¾d. to 6¼d.; medium half to three-quarter wool, 6d. to 6½d.; coarse half to three-quarter wool, 5¾d. to 6d.; pelts, 4d. to 5d. In all cases where pelts of above are sun-dried, weevil-eaten, torn, or perished, prices are from 1d. to 2d. below quotations. We notice in many consignments arriving at this season of the year that the skins are bundled before quite dry, which causes them to become sweated and consequently depreciated in value, and would strongly advise the necessity of special care being taken in regard to this matter.

Hides.—Average supplies have been submitted, competition being very limited; prices have gradually fallen in sympathy with those reported from the Eastern States. Calfskins continue in short supply, and all sell readily at quotations:—Heavies, 4½d. to 4¾d.; medium, 4d. to 4¼d.; light, 4d. to 4¼d.; light (dirty, wet, and inferior), 3½d. to 3¾d.; dry, 4½d. to 5½d. (nomiral); damaged, 3½d. to 4d. Calfskins.—Sound and good-conditioned, 2s. 6d. each; cut and damaged, 1s. to 2s. each. Attention to flaying and preparation for market is very necessary, and results in enhanced values.

Kangaroo and Furred Skins.—Kangaroo skins: These have been in good supply, and full values have been readily obtained for all offerings, best 1lb. blue skins selling to 2s. 8d. per lb. Considerable interest was taken in a line

of 4,500 wallaby skins from the North-West districts, and these sold readily at quotations:—¾lb. to 1lb. average, 2s. 6d. to 2s. 8d. blue skins, 2s. to 2s. 3d. red skins; ½lb. average, 1s. 6d. to 1s. 9d. blue skins, 1s. 3d. to 1s. 6d. red skins; 1½lb. to 2lb. average, 2s. to 2s. 6d. blue skins, 1s. 10d. to 2s. 2d. red skins; damaged line, 1s. to 1s. 8d. blue skins, 1s. 3d. to 1s. 9d. red skins; euro skins, from 1s. to 1s. 3d.; brush kangaroo, 1s. to 1s. 2d.; North-West wallaby, ¾lb. to 1lb. skins, 1s. 7d. per lb.; ¼lb. to ½lb. skins, 1s. to 1s. 5d. per lb.; extra light skins, 9d. per lb.; damaged lots, 9d. to 1s. 2d. per lb.

Opossum Skins.—Fair offerings have induced brisk competition, and values have improved from 6d. to 1s. per doz. Good greys and reds, 5s. 6d. to 7s. per dozen, average; medium greys and reds, 4s. 6d. to 5s. per dozen, average; blacks, 15s. to 16s. per dozen, nominal.

Tallow.—This market, which early in the month receded fully 1s. 6d. per cwt., has now recovered, and good mixed samples in shipping order sell readily at quotations:—

Prime (in casks)	21s. per cwt.
Medium, mixed (in casks)	19s. to 19s. 6d. per cwt.
„ (tins and oddments)	17s. to 18s. 6d. „

Horn, Hair, etc.—There is still a keen inquiry for these lines, and all forward command a ready sale:—

Horns, large and fresh	35s. to 42s. per 100.
„ small and fresh	10s. to 12s. 6d. per 100.
„ stale and perished, to ...	5s. per 100.
„ very small, to	1s. „
Rough bones	3s. 6d. per cwt.
Horsehair, to	1s. 3d. per lb.
Cowhair, to	6d. „

MONTHLY REPORT.

Messrs. Dalgety & Company, Limited, report as follows in connection with their produce sales held at Perth and Fremantle for the month ended 7th July:—

Wheat.—W.A. farmers are still large holders of wheat, and now that seeding is practically finished these growers are showing more inclination to realise. Early in the month 3s. 1d. was the nominal quotation f.o.r. Northam and similar railway stations. This, however, has eased to 3s. per bushel, at which price practically no business is passing. There is little doubt that there is more wheat held than will be required to carry us over until the new season, and the question of export becomes more pressing. Towards the end of the present month we are making a shipment to London on behalf of local growers.

Perth and Fremantle markets opened firm at 3s. 4d. to 3s. 4½d. per bushel for prime samples, whilst smutty lines have sold at 3s. 3½d. However, consignments forward have shown a big increase, with the result that, at the time of this report, 3s. 1d. is the best price obtainable at Perth for prime samples, and smutty lines are selling as low as 2s. 9d. per bushel.

Algerian Oats.—Farmers hold but little of last season's yield, and business in local lines is consequently restricted. There is good inquiry for locally grown algerians, which are readily saleable at from 3d. to 4d. per bushel in excess of ruling rates for imported algerians—the superior quality of local lines being entirely responsible for this. This State is of necessity forced to import algerians from Victoria and South Australia, and white oats from Tasmania, and for these lines there has been good sale right throughout the month. Our Melbourne office advises that values are firm for primest samples at up to 1s. 3½d. per bushel f.o.b. Melbourne; whilst our

Millicent (South Australian) branch reports similar conditions. We have to report heavy clearances of oats.

Barley.—We sold one (1) truck of "Cape" barley, locally grown, at 3s. 2d. per bushel, and about 400 bags of locally grown "English" barley at 3s. 9d. per bushel, Perth. Business in local barley has generally been quiet, and the supplies have been drawn from South Australia at from 3s. 5d. to 3s. 9d. per bushel. There was good sale for *skinless barley* in small quantities at 4s. per bushel.

Chaff.—Early in the month supplies forward to markets were curtailed, on account of farmers being engaged in seeding operations. This position was intensified owing to interrupted wet weather, but at the time of this report supplies are coming forward more freely. Conflicting opinions are held as to the quantity available for requirements until the new season's yield comes forward, and certainly there will not be any great surplus. For this reason, it is anticipated that present values should be maintained, although no advance can be looked for. All stocks of stored chaff at both Perth and Fremantle are now cleared. Buyers have been well represented at all sales, and there has been a good demand at full market rate for prime samples; but medium and inferior qualities have, as usual, been dragging and irregular.

Prices fluctuated during the month, but show no alteration upon rates reported for the month ending 7th June. There is still a demand from the North-West, and at Kalgoorlie green feed is not over-plentiful, but in the South-West and coastal districts green feed is now coming forward very rapidly, and this will certainly affect prices for inferior qualities. Our Geraldton Office advised that values at that centre are firm.

The following rates prevail :—

AT PERTH.

Prime green wheaten, extra quality (fair demand), at £4 5s. per ton.

Prime green wheaten f.a.q. (good demand), £4 to £4 2s. 6d. per ton.

Good quality wheaten averaged £3 15s. per ton.

Medium wheaten, from £3 upwards.

Prime oaten, regular sample (good demand), none forward.

Medium quality oaten sold very irregularly at from £2 17s. 6d. to £3 5s. and £3 7s. 6d. per ton.

Wheaten straw chaff, 32s. 6d. per ton upwards.

AT FREMANTLE.

Prime green wheaten (good demand), from £4 to £4 7s. 6d. per ton.

Good quality wheaten, from £3 10s. per ton upwards.

Other qualities unsaleable at this market.

Supplies have been drawn from Northam, Newcastle, York, Moora, and Pingelly districts. We are advised that there is still a good quantity of oaten chaff in the North-Western districts awaiting a market.

Hay.—Prices show no alteration. There is a falling-off of inquiries, buyers' requirements being filled for the present. We shipped several lots to be used as fodder for stock from the North-West. Nominal prices for wheaten hay, £3 5s. per ton f.o.r. Fremantle. Manger hay quiet, nominal value £5 per ton.

Pressed Straw.—There is a limited demand at £2 per ton f.o.r. Perth and Fremantle, but we cannot recommend consignments.

KALGOORLIE.

Average supplies throughout the last month have been very light, daily arrivals varying considerably. This is responsible for the better tone of the market. At the time of this report all good to prime samples are meeting with ready sale and increasing demand. Damaged and inferior qualities continue slow of sale, and the inquiry for oaten chaff is dull, excepting for absolutely prime samples.

Present values are :—

Prime green wheaten, extra quality, up to £5 5s. per ton (very good demand).

Prime wheaten, £5 (very good demand).

Good qualities, up to £4 12s. 6d. (moderate demand).

Medium samples averaged £4 5s. per ton (limited demand).

Prices for damaged and inferior grades varied considerably.

As matters stand at present, this market is considerably better than either Perth or Fremantle. We have sold a fair quantity of prime oaten hay (for race horses) at up to £7 10s. per ton. However, the local demand for this line for the present is finished.

Wheat.—We have placed several trucks at up to 4s. per bushel.

GARDEN NOTES FOR AUGUST.

By PERCY G. WICKEN.

The season has, up to the time of writing, been very mild and favourable to the growth of crops, and, judging by present appearances, excellent yields of all kinds of vegetables should be obtained. As soon as the heaviest of the rainfall is over the land should be prepared for sowing spring crops. A great deal of work can be done in the garden during this month both in the sowing of seeds and in preparing for the sowing of larger areas next month. It is the early vegetables that generally yield the largest profit, and every effort should be made to produce them as early as possible. Many plants of which seeds cannot be sown in the open this month can be raised in boxes and kept under shelter at night, and early plants thus obtained. Early tomatoes generally bring high prices, and, in the warmer districts, these should prove a profitable crop to grow. Onions are another crop that is well worth the attention of settlers. Last year, 1903-4, there were only 90 acres of onions cultivated in the State, which produced 328 tons, or an average of 3·64 tons per acre, and a large sum of money was sent out of the State to pay for onions imported from the East, which shows that there is a considerable market here for local onions for some time to go. Another point which should be remembered is that a rotation of crops is just as necessary in a garden as on a farm; the same crops, or crops belonging to the same species, should not be sown following one another on the same ground, but a root crop should be followed by cabbages, the cabbages by peas, the peas by another root crop

different to the first one, and so on. By this means the fertility of the ground is to a great extent maintained; the different crops take different food ingredients from the soil and thereby enable the greatest benefit to be derived from the manure applied, and also helps to keep the insect pests in check.

ASPARAGUS.—If the plants are starting into growth they should be planted out at once, otherwise they can be put out at any time during the month. The land should be prepared by digging and manuring deep trenches. In planting out the plants all damaged parts of the roots should be cut away, and a hole made in the trench of sufficient size to allow the roots of the plant to be well spread out in a natural position, a ridge being left in the centre of the trench so that the centre of the plant is higher than the sides; fill in with fine soil so that the top of the crown is about two inches below the surface, press down firm, and take care not to injure the roots.

ARTICHOKES (Globe)—Suckers or young plants should be planted out this month; these plants grow to a good size, and require to be planted out about three feet apart each way.

ARTICHOKES (Jerusalem).—These valuable tubers should be largely grown. For those who like the earthy flavour of the tuber they make a welcome addition to the table, and they are also very valuable as a food for stock. They are very hardy, and will grow in almost any kind of soil; the tubers are planted the same as potatoes in rows about three feet apart; the tops grow to about four feet in height, and have a yellow sunflower, similar in appearance to a small sunflower; the plant belongs to the same tribe as the sunflower.

BEANS (French or Kidney).—In warmer latitudes, where there is no danger of frosts, a supply of this vegetable may be sown, but in most districts it must still be looked on as a risky crop this month.

BEET (Red).—Sow a small supply of seed to keep up a supply; sow in drills 18 inches apart, and cover about one inch deep with fine soil. The Globe varieties will be found the best.

BEET (Silver).—May either be sown the same as red beet, or sown in a bed and the seedlings transplanted. This is a very useful plant in dry districts; the outside leaves are cut off and used as soon as they become large enough.

CABBAGE.—Any forward plants in the seed beds may be put out, and a few more seeds sown if required.

CARROT.—Sow a few seeds in well prepared land. The seeds may be sown in drills, either in single drills about 12 inches apart or in double drills three feet apart; the latter method allows of horse cultivation.

CELERY.—A little seed may be sown to keep up a supply of plants; if plants are too thick in previous seed beds they should be thinned out so as to obtain good healthy plants for transplanting. Any forward plants may be put out in well-manured trenches; as

the plants grow they should be earthed up to keep the light from the stalks and cause them to bleach.

CUCUMBERS AND MELONS.—In warmer situations free from frost, seed may be sown in the open, but in all other localities they had better be raised in a hot-bed or under glass.

LETTUCE.—Transplant any seedlings that are strong enough, and sow a further supply of seed.

ONIONS.—Sow liberally of this wholesome plant. If seedlings have already been raised in a bed they may be planted out and a few more seeds sown. If the land is well prepared the seed may be sown direct in the drills and afterwards thinned out. The beds require to be kept free from weeds.

PEAS.—Sow extensively of this vegetable, a few rows at a time, so as to keep up a succession. The earlier sown plants will now require staking, and in small areas it will pay to do this, as the yield is increased and the picking made easier. Where grown on a large scale it is not often practicable.

POTATOES.—May be planted out in the various districts as soon as all danger from frosts are over. Use only good seed, free from scab, and do not plant on land which has grown potatoes last season. Two or three eyes are enough to leave on each piece when sowing; plant in rows three feet apart and one foot apart in rows.

SWEET POTATOES.—Make a seed bed and place some whole tubers in it; these will presently send out a nnmber of shoots which can be broken off and planted out as required.

TOMATOES.—In warmer localities plants that have been raised in beds may be planted out in the open, but, in cooler parts, the seed can be sown, ready for planting out later on.

FARM.—The season has so far proved favourable for the growth of the cereal crops, and the crops are now well forward; if the ground is not too wet a good rolling when the crop is about six inches high will prove of benefit, and if the crop is cut with the binder, this will enable it to be cut lower, and will also make the binder work much more satisfactorily than on the rough ground. In most districts potatoes can be sown before the end of the month. It is also a good time to sow mangels and sugar beets, which will provide excellent food for the stock during the summer months when green feed is scarce. Hungarian millet is a quick growing crop and is well worthy of attention, both as a green feed and also to obtain the grain for poultry. A small area of buckwheat is of advantage for the bees. Jerusalem artichokes and arrowroot are valuable crops to grow where pigs are kept, as they will give good results, and the pigs will harvest them without any further trouble. *Paspalum Dilatatum* and *Paspalum Virgatum* grass, either seed or roots, may be planted out with a reasonable hope of success. Grass paddocks may be considerably improved by running a heavy harrow over the surface, a chain harrow is best, this spreads the manure and breaks up the clods and generally freshens up and stimulates the growth of grass.

THE CLIMATE OF WESTERN AUSTRALIA DURING JUNE, 1904.

This month was characterised by severe storms in Southern portions, and especially over the ocean between Cape Leeuwin and Tasmania, during the middle of the month. Three distinct stormy periods occurred in our West and South-West districts, viz., on the 8th to 9th, 14th to 20th, and 25th to 27th, with mostly fine bright weather in between. During the middle period remarkably wintry weather prevailed; the South-West coast was visited by a succession of heavy gales, accompanied by unusually intense thunderstorms, and terrific seas swept along repeatedly from the Leeuwin eastwards. Many fine vessels were unable to progress against the fury of the storm, and were compelled to heave-to for periods of 12 to 30 hours. The s.s. Kyarra, which left Adelaide for Fremantle on the 18th, encountered a hurricane from the westward on the 20th, and at noon on that day recorded a barometer reading of 28·62, rising to 30·00 (nearly an inch and a-half) during the next 36 hours.

During the fine periods frosts occurred in places, especially at the commencement of the month, the lowest surface temperature recorded being 23°, at Katanning, on the 2nd and 3rd.

Turning now to the general climatic conditions, we find that pressure was about or slightly below the normal throughout. Temperature was unusually low in the tropics, the mean maximum at Wyndham, in the extreme North, being nearly 6° below that for previous years; elsewhere it was about or slightly below the normal.

The rainfall was on the whole above the average in the tropics, below in central latitudes, but unusually heavy throughout South-West districts, and above the average generally in Southern districts, the maximum being just south of Perth, where the average for the square degree was 10·75 inches. On the Coolgardie fields it was about or slightly above the normal in Southern portions, but defective in Northern.

The following table shows the condition of the ground as to frosts, the figures representing the mean and absolute lowest temperatures recorded on the surface by a minimum thermometer exposed each night:—

Station.	Mean.	Lowest.	Date.
Peak Hill	41·0	32·0	5
Cue	40·3	31·0	5, 28
Coolgardie	41·0	32·1	3
Southern Cross	40·2	27·0	3
Walebing	37·0	28·0	1
York	40·0	31·0	1, 4
Perth Observatory	46·1	36·1	1, 3
Wandering	—	—	—
Katanning	37·5	23·0	2, 3
Bridgetown	37·1	24·0	3
Karridale	43·0	24·0	3

The Climate of Western Australia during June, 1904.

Region	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. June, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	30·026	30·008	30·181	29·863	81·8	64·7	73·2	89·0	56·2	87·6	67·5	96·0	54·0	13	2917
	Derby	30·026	30·006	30·123	29·873	83·4	58·8	71·1	87·8	48·4	85·5	60·3	96·0	48·0	122	3252
	Broome ...	30·000	30·014	30·176	29·872	78·2	60·1	69·2	87·5	53·0	82·6	60·1	96·9	48·4	14	2121
	Condon ...	30·056	30·051	30·260	29·879	75·2	54·5	64·8	80·1	46·0	78·3	53·0	94·0	38·8	86	323
	Cossack ...	30·058	30·059	30·304	29·860	75·1	57·1	66·1	84·0	51·0	76·9	57·3	93·0	44·9	342	736
	Onslow ...	30·075	30·044	30·310	29·890	73·0	52·0	62·5	78·0	41·0	77·2	55·5	87·0	38·5	155	633
	Carnarvon ...	30·144	30·062	30·381	29·801	73·1	51·6	62·4	80·9	42·3	73·0	53·0	84·0	38·2	205	408
	Hamelin Pool...	30·090	30·076	30·472	29·924	68·8	50·1	59·4	74·0	41·8	69·7	52·0	79·8	36·2	81	342
	Geraldton ...	30·065	30·080	30·430	29·790	69·8	52·5	61·2	75·2	44·3	69·3	52·8	79·2	35·0	422	723
Inland:	Hall's Creek *	30·114	30·087	30·292	29·878	74·8	50·6	62·7	84·2	40·0	80·8	50·9	89·5	33·1	80	2791
	Marble Bar ...	...	...	...	...	76·7	54·4	65·6	85·0	46·0	...	...	...	...	81	620
	Nullagine * ...	30·101	30·086	30·365	29·831	73·6	46·2	59·9	81·0	35·0	74·9	48·2	89·8	32·7	43	453
	Peak Hill ...	30·135	30·116	30·440	29·840	65·0	46·0	55·5	72·0	40·0	66·1	48·0	77·8	37·5	31	306
	Wiluna ...	30·128	...	30·512	29·771	64·1	43·4	53·8	73·3	34·5	...	...	...	...	29	347
	Cue	30·135	30·118	30·524	29·808	64·5	44·4	54·4	74·0	37·5	65·7	47·0	78·0	34·0	62	227
	Yalgoo ...	30·090	30·103	30·526	29·730	64·7	45·7	55·2	75·5	37·5	65·1	46·3	79·9	32·9	106	309
	Lawlers ...	30·120	30·128	30·550	29·716	64·3	46·0	55·2	75·0	37·0	63·2	45·0	76·2	33·7	68	347
	Laverton ...	30·127	...	30·558	29·652	61·7	44·4	53·0	73·5	35·0	...	...	...	...	94	470
	Menzies ...	30·131	30·120	30·628	29·625	61·3	44·2	52·8	73·0	35·7	62·1	45·3	75·6	33·3	135	275
	Kanowna ...	...	...	...	...	61·4	44·2	52·8	72·1	35·7	...	...	...	...	132	278
	Kalgoorlie ...	30·096	30·111	30·636	29·467	61·4	45·5	53·4	72·0	36·8	61·6	45·8	76·4	34·0	94	333
	Coolgardie ...	30·091	30·114	30·641	29·472	60·0	44·9	52·4	72·1	35·7	61·4	44·2	78·3	31·5	138	438
	Southern Cross	30·094	30·084	30·634	29·486	61·1	43·9	52·5	73·8	32·4	62·3	42·5	77·4	28·0	262	672
	Walebing ...	...	...	...	...	61·5	42·7	52·1	70·2	33·0	...	...	...	...	499	938
	Northam ...	...	...	...	...	62·5	42·0	52·2	70·0	33·0	...	...	...	...	592	1155
	York	30·059	30·086	30·610	29·530	62·3	42·5	52·4	70·0	32·2	63·3	42·8	76·0	30·4	512	1024
	Guildford ...	...	...	...	...	64·8	46·0	55·4	71·0	32·8	...	...	...	...	767	1644

* Average for three years only.

The Climate of Western Australia during June, 1904—*continued*.

Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
					June, 1904.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1
South-West and South Coast:															
Perth Gardens ...	30·036	30·096	30·567	29·550	64·0	49·7	56·8	70·0	40·2	64·4	47·6	81·0	34·0	785	1541
Perth Observatory	30·059	30·072	30·602	29·541	64·1	49·8	57·0	70·0	42·0	63·5	49·0	73·2	36·9	770	1541
Fremantle ...	30·051	30·062	30·576	29·494	64·1	52·6	58·3	69·0	43·0	64·0	51·9	73·0	40·0	847	1543
Rottnest ...	30·026	30·048	30·541	29·484	63·9	54·4	59·2	70·0	46·8	63·3	54·3	69·0	42·4	558	1090
Mandurah ...	...	...	...	...	63·8	48·4	56·1	70·0	33·0	...	...	...	...	664	1520
Wandering ...	...	...	...	...	56·8	42·4	49·6	71·0	37·0	...	...	...	...	827	1436
Narrogin... ...	...	...	...	...	57·1	43·8	50·4	64·5	31·8	...	...	...	...	520	988
Collie	...	...	...	...	60·7	39·5	50·1	66·3	27·2	...	...	...	...	780	1673
Donnybrook ...	...	...	...	...	61·5	43·0	52·2	68·8	33·2	...	...	...	...	701	1801
Bunbury ...	30·020	30·056	30·600	29·520	64·4	49·4	56·9	71·0	38·2	63·9	48·2	73·7	35·2	797	1808
Busselton ...	...	...	...	...	62·9	46·2	54·6	69·0	38·0	...	...	...	...	718	1623
Cape Naturaliste	29·980	...	30·555	29·406	62·0	52·9	57·4	67·8	44·6	...	...	...	...	715	1601
Bridgetown ...	...	...	...	...	62·2	38·8	50·5	68·0	26·0	...	...	...	...	555	1411
Karridale ...	29·972	30·029	30·542	29·492	62·0	48·0	55·0	68·0	31·0	62·4	47·8	76·0	31·8	995	2090
Cape Leeuwin ...	29·945	29·978	30·560	29·260	63·0	53·0	58·0	69·0	46·0	62·3	53·5	70·2	46·4	715	1782
Katanning ...	30·032	30·056	30·640	29·410	58·8	43·4	51·1	64·0	30·0	59·2	42·4	71·5	29·5	269	809
Albany	29·976	30·008	30·626	29·252	62·2	45·6	53·9	69·8	36·8	61·5	46·1	73·5	35·4	617	1966
Breaksea... ...	29·967	30·011	30·632	29·175	62·0	52·0	57·0	69·0	45·0	60·2	50·9	72·0	41·0	368	1536
Esperance ...	...	30·046	...	...	65·2	47·5	56·4	74·2	37·2	63·3	47·9	76·9	35·5	427	1180
Balladonia ...	30·090	...	30·645	29·590	61·3	44·0	52·6	75·0	35·1	...	...	...	...	131	457
Eyre *	29·994	30·102	30·552	29·367	65·0	47·4	56·1	76·6	35·6	64·5	46·5	78·6	29·0	252	837
INTER-STATE.															
Perth	30·009	30·072	30·602	29·541	64·1	49·8	57·0	70·0	42·0	63·5	49·0	73·2	36·9	770	1541
Adelaide	...	30·124	...	...	59·2	47·1	53·2	66·0	41·7	60·3	46·7	76·0	32·5	392	...
Melbourne	30·040	29·995	30·376	29·287	63·9	45·0	51·0	64·9	32·9	56·9	43·9	64·1	33·6	329	...
Sydney	30·080	30·089	30·280	29·700	59·0	44·0	51·5	70·0	40·0	60·5	48·3	74·7	38·1	19	...
Cocos Island ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Average for three years only.

The Observatory, Perth, June, 1904.

W. E. COOKE, Government Astronomer.

RAINFALL for May, 1904 (completed as far as possible), and for June, 1904 (principally from Telegraphic Reports).

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham ...	30	3	13	2
6-Mile	55	2	...	...
The Stud Station	...	...	...	...
Carlton	Nil	...	...	...
Denham	...	...	...	...
Rosewood Downs	84	4	...	...
Argyle Downs ...	...	...	...	...
Lisadell	50	1	...	...
Turkey Creek ...	104	3	139	3
Hall's Creek ...	201	4	80	5
Nicholson Plains	...	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	...	...	...	...
Beagle Bay ...	...	...	...	...
Derby	7	1	12	3
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	75	3	92	4
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	108	2	14	1
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	32	2	193	5

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
North-West:				
Wallal	20	1	73	3
Condon	24	3	86	3
Pardoo	...	...	...	...
DeGrey River ...	21	1	...	...
Port Hedland ...	36	2	140	4
Boodarie ...	35	2	...	...
Warralong ...	28	3	...	...
Muccan	...	...	...	...
Ettrick	27	3	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Station Peake ...	29	1	...	...
Coongon	23	1	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	37	2	89	6
Marble Bar ...	34	5	81	5
Warrawoona ...	35	3	65	4
Corunna Downs...	25	2	...	...
Nullagine ...	18	1	43	4
Mount Edgar ...	...	...	...	...
Kerdiadary ...	Nil	...	...	...
Roy Hill	...	...	...	...
Middle Creek ...	...	...	...	...
Mosquito Creek	31	1	...	...
Mulga Downs ...	16	1	...	...
Woodstock ...	20	1	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	...	...	...	...
Millstream ...	...	...	...	...
Yandyarra ...	20	1	...	...
Mallina	...	...	...	...
Whim Creek ...	51	2	95	7
Cooyapooya ...	84	7	...	...
Woodbrooke ...	63	3	...	...
Croydon	36	2	...	...

RAINFALL—*continued.*

Stations.	May. No. of points. 100 = 1in.	May. No. of wet days.	June. No. of points. 100 = 1in.	June. No. of wet days.
North-West—*cont.*				
Roebourne ...	94	4	198	6
Cossack	106	5	342	7
Fortescue ...	57	5	108	3
Mardie	...	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	...	...	...	...
Onslow	306	6	155	6
Peedamullah ...	...	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	113	5	...	...
Peake Station ...	202	5	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	135	4	...	...
Yanrey	175	3	...	...
Point Cloates ...	...	...	...	...
Gascoyne:				
Winning Pool ...	108	5	140	6
Coordalia ...	...	...	...	...
Towara	...	...	...	...
Ullawarra ...	111	5	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	...	...	...	...
Yanyeareddy ...	...	...	...	...
Williambury ...	...	...	...	..
Wandagee ...	...	...	...	...
Bernier Island ...	76	4	...	...
Boolathana ...	72	3	...	...
Carnarvon ...	43	5	205	7
Brick House ...	30	1	...	..
Cooralya	...	...	...	...
Doorawarrah ...	...	...	...	...
Bintholya ...	150	5	...	...
Mungarrah ...	...	...	...	...
Clifton Downs ...	108	4	...	...
Dairy Creek ...	127	4	...	...
Upper Clifton Downs	...	...	...	...
Errivilla	...	...	...	...
Gascoyne—*contd.*				
Dirk Hartog Island	...	...	...	...
Sharks Bay ...	163	4	158	12
Kararang ...	10	1	...	...
Meedo	102	4	...	...
Tamala	...	...	...	...
Wooramel ...	213	5	208	7
Hamelin Pool ...	197	4	81	11
Byro	112	4	...	...
Yarra Yarra ...	...	...	141	2
Berringarra ...	146	6	...	...
Mt. Gould ...	205	2	...	...
Moorarie ...	131	2	...	...
Wandary... ...	180	3	...	...
Peak Hill ...	78	5	31	5
Horseshoe ...	172	5	...	...
Mt. Fraser ...	129	1	...	...
Abbotts	168	5	60	3
Belele	...	...	...	...
Mileura	136	2	...	...
Milly Milly ...	102	5	33	5
Manfred ...	140	4	...	...
New Forest ...	107	3	...	...
Woogorong ...	186	4	...	...
Boolardy ...	...	...	...	...
Twin Peaks ...	104	3	...	...
Billabalong ...	153	4	...	...
Wooleane ...	216	4	77	6
Murgoo	150	3	102	6
Yallalonga ...	125	6	...	...
Meka	188	5	101	4
Mt. Wittenoom ...	170	5	...	...
Nannine	100	4	67	4
Star of the East...	108	4	55	3
Annean	135	3	49	4
Coodardy ...	118	3	45	2
Cue	136	5	62	3
Day Dawn ...	144	5	59	3
Lake Austin ...	155	2	69	3
Lennonville ...	292	7	81	8
Mt. Magnet ...	273	6	78	7
Warracootharra	...	...	...	...
Challa	131	5	53	6
Youeragabbie ...	214	3	...	...
Murrum	170	3	72	5
Burnerbinmah ...	106	6	...	...

RAINFALL—*continued.*

Stations.	May. No. of points. 100 = 1in.	May. No. of wet days.	June. No. of points. 100 = 1in.	June. No. of wet days.
GASCOYNE—*contd.*				
Barnong	48	4	...	...
Mellinbye ...	69	6	183	12
Yalgoo	93	4	106	9
Wagga Wagga ...	96	4	100	7
Gabyon	97	3	178	8
Wurarga ..	...	...	...	...
Muralgarra ...	...	...	126	10
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	74	6	...	...
Mount View ...	42	2	...	...
Mumby	87	5	...	...
Yuin	90	4	82	8
Northampton ...	139	5	548	14
Oakabella ...	128	5	...	...
Narra Tarra ...	68	4	...	...
Tibradden ...	...	...	...	...
Myaree	144	6	...	...
Sand Springs ...	106	5	498	11
Mullewa... ...	75	4	323	14
Kockatea ...	48	3	350	12
Bootenal ...	...	...	...	...
Geraldton ...	188	8	422	14
Greenough ...	65	3	273	11
Bookara	120	5	518	11
Dongara ...	74	7	325	12
Dongara (Pearse)	64	7	325	12
Strawberry ...	78	4	488	13
Nangetty ...	83	5	...	...
Mingenew ...	59	8	412	16
Urella	55	3	383	11
Yandenooka ...	111	5	488	13
Rothesay ...	69	2	...	...
Field's Find ...	114	5	...	...
Carnamah ...	134	7	394	13
Watheroo ...	149	9	572	16
Dandaragan ...	199	9	564	16
Moora	141	8	508	16
Yatheroo ...	274	11	673	16
Walebing ...	175	10	499	16
New Norcia ...	121	8	521	16
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	347	11	874	17
Belvoir	315	10	765	19
Mundaring ...	371	17	1,095	19
Wanda	330	16	646	18
Guildford ...	421	16	777	19
Kalbyamba ...	...	...	...	...
Canning W't'r'w'ks	319	8	950	16
Perth Gardens ...	334	16	785	19
Perth Observatory	319	16	770	19
Subiaco	396	15	742	19
Fremantle ...	431	18	847	19
Rottnest... ...	370	21	558	19
Armadale ...	389	15	1,054	15
Rockingham ...	524	18	861	19
Jarrahdale ...	744	15	1,820	18
Mandurah ...	482	17	664	12
Pinjarra	501	15	978	19
Yarloop	428	19	1,094	19
Harvey	457	17	1,260	17
Upper Murray ...	627	16	1,077	19
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	176	9	380	11
Dowerin ...	162	8	360	13
Momberkine ...	150	10	435	9
Monglin ...	240	8	499	14
Newcastle ...	265	11	815	16
Eumalga ...	277	12	767	13
Northam ...	194	11	592	16
Grass Valley ...	...	...	...	...
Meckering ...	159	9	430	15
Cunderdin ...	240	9	436	11
Codg-Codgin ...	...	...	249	13
Yarragin ...	236	8	...	...
Doongin... ...	234	11	301	13
Cuttening ...	205	11	...	...
Whitehaven ...	316	8	...	...
Sunset Hills ...	204	14	445	13
Cobham	252	17	525	19

RAINFALL—*continued.*

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West, Central—*contd.*				
Yenelin	258	6	...	...
York	195	22	512	23
Dalebridge ...	189	12	431	12
Beverley ...	242	11	585	14
Bally Bally ...	228	15	...	...
Barrington ...	229	13	472	15
Stock Hill ...	187	10	516	14
Sunning Hill ...	242	11	610	16
Brookton ...	...	...	534	14
Wandering ...	366	13	827	13
Glen Ern ...	257	17	713	18
Pingelly ...	117	7	626	12
Marradong ...	389	12	961	18
Bannister ...	364	15	...	...
Narrogin ...	154	17	464	19
Narrogin Experimental Farm	199	18	520	19
Wickepin ...	173	12	...	...
Gillimaning ...	138	13		...
Bunking ...	339	10	316	7
Bullock Hills ...	163	12	...	...
South-West Division (Southern Part):				
Bunbury ...	427	18	797	15
Collie	345	19	780	22
Glen Mervyn ...	389	12	685	13
Dardanup ...	...	...	...	...
Donnybrook ...	365	15	701	18
Boyanup ...	475	15	743	15
Ferndale ...	423	17	669	17
Busselton ...	425	22	718	18
Quindalup ...	375	18	...	...
Cape Naturaliste	355	18	715	17
Lower Blackwood	555	16	755	19
Karridale ...	546	21	995	23
Cape Leeuwin ...	580	22	715	22
Biddellia ...	422	17	...	...
The Warren ...	605	19	1055	20
Lake Muir ...	327	11	...	...
The Peninsula ...	282	19	...	...

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*continued.*				
Mordalup ...	289	15	...	...
Deeside	407	17	...	...
Riverside ...	394	18	...	...
Balbarup ...	331	12	...	...
Wilgarup ...	332	20	594	19
Mandalup ...	...	...	...	...
Bridgetown ...	336	19	555	23
Westbourne ...	350	21	...	...
Hillton	238	5	543	13
Greenbushes ...	477	14	649	16
Greenfields ...	294	14	549	19
Glenorchy ...	309	14	...	...
Williams ...	236	19	565	17
Arthur	190	9	450	16
Darkan	258	9	...	...
Wagin	227	13	363	15
Glencove ...	183	16	307	18
Dyliabing ...	218	13	...	...
Katanning ...	184	17	269	19
Kojonup ...	278	17	520	18
Broomehill ...	157	11	315	14
Sunnyside ...	145	15	321	18
Woodyarrup ...	141	14	291	14
Minelup ...	200	14	220	15
Cranbrook ...	125	11	280	11
Toolbrunup ...	210	14	311	17
Tambellup ...	165	15	308	15
Blackwattle ...	229	11	...	...
Woogenellup ...	245	14	...	...
Mt. Barker ...	448	18	394	17
Kendenup ...	392	17	375	15
St. Werburgh's...	364	18	...	...
Forest Hill ...	443	22	...	...
Denmark ...	502	15	693	14
Grassmere ...	614	19	640	17
Albany	704	25	617	19
King River ...	570	16	518	12
Point King ...	575	22	645	13
Breaksea ...	668	28	368	20
Wattle Hill ...	...	...	...	...
Cape Riche ...	795	10	...	...
Cherilullup ...	213	15	260	14
Pallingup ...	141	14	...	...
Bremer Bay ...	490	15	330	10
Jarramongup ...	...	...	...	...

RAINFALL—*continued.*

Stations.	May. No. of points. 100 = 1in.	May. No. of wet days.	June. No. of points. 100 = 1in.	June. No. of wet days.
Eastern Division:				
Dural	276	5	...	...
Wiluna	242	9	29	4
Gum Creek ...	120	3	...	...
Mt. Sir Samuel ...	120	3	30	3
Lawlers	105	8	68	7
Leinster G.M. ...	158	5	46	3
Darda	231	5	...	...
Lake Darlôt ...	104	4	...	...
Mt. Leonora ...	109	6	95	5
Mt. Malcolm ...	112	6	78	5
Mt. Morgans ...	155	5	77	5
Burtville ...	170	4	65	3
Laverton ...	171	6	94	5
Murrin Murrin...	175	6	90	5
Yundamindera ...	239	6	138	5
Tampa	65	3	...	...
Kookynie ...	83	4	88	6
Niagara	95	5	82	4
Yerilla	93	5	88	5
Edjudina ...	111	7	...	...
Menzies	82	5	135	6
Mulline	137	3	61	7
Waverley ...	117	5	82	9
Goongarrie ...	97	4	109	8
Mulwarrie ...	154	3	101	5
Bardoc	80	3	79	4
Broad Arrow ...	120	9	99	7
Kurnalpi ...	126	7	148	6
Bulong	195	7	132	7
Kanowna ...	108	9	132	11
Kalgoorlie ...	152	7	94	7
Coolgardie ...	134	8	138	11
Burbanks ...	144	7	161	7
Woolubar ...	198	6	...	...
Widgiemooltha...	192	8	120	11
50-Mile Tank ...	219	4	186	8
Waterdale ...	217	9	...	...
Norseman ...	264	12	185	10
Lake View ...	339	10	...	...
Bulla Bulling ...	153	10	156	13
Woolgangie ...	...	...	...	...
Boondi	224	9	212	12

Stations.	May. No. of points. 100 = 1in.	May. No. of wet days.	June. No. of points. 100 = 1in.	June. No. of wet days.
Eastern—*contd.*				
Boorabbin ...	198	9	236	13
Koorarawalyee ...	226	8	241	12
Karalee	172	5	229	7
Yellowdine ...	...	...	...	...
Southern Cross...	229	8	262	10
Parker's Range...	200	13	280	13
Parker's Road ...	184	8	251	9
Mt. Jackson ...	233	6	186	8
Bodallin ...	179	10	...	...
Burracoppin ...	115	6	225	10
Kellerberrin ...	258	12	310	11
Merredin ...	78	3	220	7
Nangeenan ...	148	8	279	9
Mangowine ...	219	4	...	...
Wattoning ...	...	...	...	...
Eucla Division:				
Ravensthorpe ...	248	11	175	14
Coconarup ...	228	10	178	13
Hopetoun ...	333	10	391	12
Fanny's Cove ...	...	...	...	...
Park Farm ...	347	13	...	...
Esperance ...	390	14	427	13
Gibson's Soak ...	305	16	...	...
30-Mile Condenser	271	13	...	...
Swan Lagoon ...	258	11	...	...
Grass Patch ...	240	12	...	...
Myrup	395	14	...	...
Lynburn ...	263	14	300	12
Boyatup	216	12	...	...
Middle Island ...	305	17	...	...
Point Malcolm ...	340	17	...	...
Israelite Bay ...	373	13	178	12
Balbinia	277	8	...	...
Frazer Range ...	131	4	...	...
Balladonia ...	211	8	131	8
Southern Hills ...	...	...	...	...
Eyre	249	11	252	14
Eucla	349	8	162	15

The Observatory, Perth,
6th July, 1904.

W. E. COOKE,
Government Astronomer.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.

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NOTES.

Big Apple Crop.—From latest fruit reports, it is estimated that this season's apple crop of the United States of America will be far and away the biggest on record.

Removal of Offices.—For the future the Department of Agriculture (together with the Agricultural Bank, Stock, and Rabbit Departments) will be located in the old Legislative Council Chambers, next to Government House, St. George's Terrace.

Fruit Fly Parasite.—Since going to press with our last issue, Mr. Compere, the Government Entomologist, has returned to this State, bringing with him the parasite of the fruit fly, as well as some other valuable insects. Mr. Compere's report is published in this issue.

Demand for Insect Parasites.—Mr. Alex. Craw, the State Horticultural Officer for California, has received an offer of £1,000 a year from the Hawaii Government for the purpose of undertaking the introduction of parasites of those pests that are causing so much damage to the fruit crops in Hawaii.

The Indian Wheat Crop.—The final official report on the wheat crop of India estimates the production at the equivalent of no less than 43,808,370qrs. of 480lb., or 7,566,590qrs. more than the great crop of 1903—up to that date the greatest ever returned—though allowance must be made for an extension of the tracts of

country covered by the recent statistics. The estimated area of the crop harvested this year is 27,773,114 acres, or nearly 4,700,000 acres more than that of last year. If wheat should be sufficiently needed in importing countries to raise the price sufficiently, India will have a great surplus to ship.

BREEDING OF ZEBRULES.—The Acting Director of Agriculture has been taking active steps towards the introduction of the breeding of zebrules in this State. The breed is made by the cross of a zebra stallion and a mare. Mr. Crawford states "That a series of trials had been made with zebrules for artillery work, in which it was found they stood fire well, and showed little or no attention to the firing of the guns; in fact, nothing seemed to frighten them. There is bound to be, in a short time, a big demand for these animals in India; and from one of the English papers I recently learnt that the Indian Government had given orders for a considerable number of zebra mares and stallions for the purposes of raising as many zebra stallions for breeding zebrules."

COW RUGS.—Cow rugs are becoming more plentiful every winter, but considering the testimony borne by practical farmers all over the State as to the great advantage of the system, it is surprising that so many farmers in the cold, wet districts continue to leave their cows exposed to the weather. There are two classes of farmers who do not adopt rugs. One class is represented by the men who do not grasp the importance of saving food by preventing it from being consumed in keeping up the animal heat under adverse conditions, and the second by those who know well enough, but are adverse to taking any trouble. The last class will tell you that cows ought to be protected from the weather, but they are in favour of sheds. Sheds are so much better, in their opinion, but you find out that they intend to build an up-to-date shed next season. The planning of that shed will occupy their attention for several years, and they will consider their ideas much in advance of the man who is content to use rugs now. Let me tell that man that his ideas are quite out of date. A proper shed is a good thing, but it cannot be a substitute for rugs. It is needed in addition to rugs, for the cow requires to be kept warm during the day as well as at night. She has to find her feed by being all day in the paddocks, and in rainy climates she cannot be protected from cold by a shed, which only protects her at night.

REMEDIES FOR GRASSHOPPERS.—Mr. Leonard Norris, Government Agent, Vernon, British Columbia, writing under date of 11th August, says:—"I am sending you to-day, under separate cover, for identification, a specimen of an insect secured by Mr. S. A. Muir in Vernon a day or two ago, which may be of value as an exterminator of grasshoppers." On this being referred to Dr.

Fletcher, the Entomologist for British Columbia, he made the following report on the matter:—"The large asilid fly mentioned as sent to you from Vernon for identification as a possible exterminator of grasshoppers is *Scleropogon helvius*. I have never actually seen this insect attacking grasshoppers, but have little doubt that it would do so. It is not uncommon in the Okanagan Valley, and I have specimens captured while devouring various kinds of insects. The popular name of these asilid flies is bee-killers, or robber flies. All are predaceous." The best remedy thus far recommended is known as "The Criddle Mixture." It has been given no stint of praise by Dr. Fletcher. In regard to it he says:—"It has entirely replaced the cumbersome and inadequate hopper-dozer." It is made up of the following:—One part Paris green, two parts salt, 75 to 100 parts horse manure, by measure. Add enough water to make soft without being sloppy. Scatter it about the fields in quantity according to the number of grasshoppers. They will be attracted for 40 feet. It is most effective when fresh, but will do excellent work when several weeks old, even after being washed by rain. In certain instances cited by Dr. Fletcher, this remedy has been found very effective, and it is considered much cheaper on the whole than trying to fight them by using the hopper-dozer. Owing to its inexpensiveness, it is certainly worthy of a trial where depredations are feared from these pests.—*Exchange*.

GRAPES OUT OF SEASON.—Experiments have been carried out at the Wagga Experimental Farm, with a view of showing that grapes may be kept on their vines in a good condition long after the grape season is over. The Director of Agriculture, Mr. W. S. Campbell, has received a report on the subject from Mr. W. J. Allen, Departmental Fruit Expert. In the course of the report Mr. Allen remarks:—"Last week we picked some of the following varieties of grapes, which sold at 20s. per half-case in Sydney:—Tokay, Almeria, Cornichon, and Doradillo. The trade speaks very highly of the condition and keeping quality of the fruit." The ordinary grape season terminated some months ago, but by a special method of protection, the grapes referred to were kept on the vines in excellent condition until past midwinter. The cost of protecting the vines is said by Mr. Campbell to be very small indeed. If that be the fact, the difference between 20s. a half-case, obtained now, and 2s. 6d. to 3s. in the height of the season, will doubtless induce many vigernons to seek for information as to the manner in which the protection is carried out. Up to the present we are unaware of the particular method adopted, yet it has been known for years that grapes enveloped with grease-proof paper bags while on the vines will hang very much longer than if left exposed. Another plan often tried with success is to cut the bunch with a fair length of wood to it, which is inserted in a glass of water, in which several pieces of charcoal have first been placed, and then kept in a cool, dark store house, the idea being to supply the grapes with an equal amount of moisture that is given off by them by evaporation.

THE INTRODUCTION OF THE FRUIT FLY PARASITE.

By G. COMPERE.

ACTING DIRECTOR.—I herewith beg to submit the following report concerning my recent mission to Brazil in search of the natural enemy of the fruit fly, *Ceratitis capitata*. In this I have only dealt with the fruit flies, leaving the other insects met with for a future report, to be made jointly to yourself and the State Commissioner of Horticulture of California.

Acknowledgments.—Thanks are due to Dr. H. Von Ihering, Director of the Museum at Sao Paulo, Brazil, for information furnished, and to the officers of the Royal Mail Packet Company steamer "Nile," and also to W. Service, purser of the P. and O. steamer "China," and H. Shearing, butcher of the same steamer, for their kind attention and permission of allowing me daily access to the cool chambers, in which I had placed my insects.

January 7th I left Perth for Sao Paulo, Brazil, going *via* Sydney, San Francisco, and New York, and arrived at Pernambuco April 18th, where a short stay was made, during which I visited the fruit market and other places where fruits were exposed for sale. A close examination of all such fruits failed to reveal any signs of fruit fly maggots.

Bahia.—This was the next port at which the steamer called, and during its stay, a visit was paid to the fruit markets and some near-by gardens. In the markets not a single infested fruit was noticed. In one of the gardens a specimen of fly was noticed in the act of ovipositing in a fruit of *Genipa Americana*. This specimen was taken, and proved to be *Trypeta biseriata*; another specimen was found at rest on the under side of a leaf. The fruit in which the first specimen had laid her eggs was taken away and placed in a small jar, and from it six flies were reared.

The next place reached was Rio de Janeiro, where three days were spent, during which time the markets were visited every morning, and the remainder of time in visiting the gardens in and around the city; but notwithstanding the large amount of fruits exposed for sale there, not a single fruit infested with maggots was noticed, and the same in the gardens. No traces of any fruit fly could be detected, there being plenty of ripe guavas and oranges at the time.

San Paulo, was reached 26th April, and the following day I visited an orange grove at Sant Ann. There a few scattered half-decayed oranges were found upon the ground. Some of these showed unmistakable signs of having once been punctured by fruit flies, but the closest examination failed to reveal any maggots in the decayed fruit. In looking over the trees two flies were noticed

depositing their eggs in the ripe fruit. Then I called upon the owner, and through an interpreter I questioned him as to what amount of damage was caused by fruit flies in his orchard. He informed me that during the eighteen years in which he had possession of the orchard he never had noticed any damage to fruits caused by fruit flies; in fact, he never knew that there were such insects. Returning to the orchard, a tree-to-tree inspection was began, and after more than an hour's work I was rewarded by discovering some small Ichneumon flies on some oranges, apparently in search of infested fruits. A close watch being kept upon them for some time, one was discovered in the act of ovipositing in an orange. This orange was taken from the tree as soon as the parasite had finished laying her eggs and placed in a jar and kept in the room. Five days later the fruit fly maggots had completed their growth and pupated in the bottom of the jar. There were seven of these pupa, and on May 6th five parasites issued, and the following day two fruit flies made their appearance. Meantime other gardens had been visited in Tambata, Sao Caetana, Mooca, and Sao Bernardo, and every damaged fruit met with was examined, but very few maggots were found. In many of the decaying fruits there were present from one to five ground beetles of the Staphylinidæ species. About a dozen of these beetles were placed in a large jar, and ripe fruits of various kinds placed in with them, but they would not feed upon it, and, after two days, an orange which was infested with fruit fly maggots was placed in the jar. Some of the beetles at once entered the decayed portion of the fruit, and in less time than it takes to mention it they would emerge from the fruit with a maggot in their mouth, and in a remarkable short time devour them. This fruit was removed from the jar in less than an hour. An examination showed that the beetles had captured and destroyed every maggot which it contained when placed in the jar.

None of the owners of gardens visited at the above-mentioned places had ever noticed any damage caused to oranges by fruit fly. By diligent searching, occasional fruits could be found infested by maggots, but fallen fruit seldom contained any, and the same with the Japan Persimon (*Diospyros kaki*). In all I reared seven different species of fruit flies while in the Sao Paulo district, two specimens of our *Ceratitis capitata* amongst them, and some specimens also of the Mexican peach fly (*Trypeta fraterculus*). Two species of parasites were also reared.

Peaches were out of season at the time of my visit, but those who had peach trees growing in their gardens informed me that a large number of the fruits were destroyed by maggots every year. This is not to be wondered at when it is taken into consideration that there are only a limited number of peach trees grown in the district, and no less than six different species of flies to attack them. Finding that I could not secure sufficient material from which to breed parasites from in the Sao Paulo district, I concluded to return to Bahia, that being recognised as the fruit garden of Brazil. At

the time of my arrival the following fruits were in season, oranges, limes, guavas, Sapodilla plum (*Sapta Achras*), (*Ptanga Pitangueria*), (*Genipa Americana*), (*Grumixameria*), and a fruit called Caja by the natives, all the above-mentioned fruits being subject to the attacks of the fruit flies; but so little damage is caused by their attack that not a single person was met with during my stay in that district that had ever heard or knew of such insects as fruit flies or maggots. And notwithstanding the fact that the growers had no knowledge of such insects as fruit flies, I have since reared twelve additional to the seven species secured at Sao Paulo, and amongst them *Trypeta ludens*, the notorious Mexican orange fly. There was also present one additional species of (*Ichneumon*) parasite, as well as the Staphylindæ beetles, the latter being very numerous. Finding that there was no possible chance of securing enough maggots from which to breed parasites in sufficient numbers to be of any use by collecting from orchard to orchard, I decided to cover a pitinga tree on which the fruit was just beginning to ripen. This was done by placing a frame covered with mosquito netting over the tree, then under this cover was placed as many fruit flies as could be captured from day to day, amongst them being several specimens of our *Ceratitis capitata*. Some of the flies on being liberated would fly to the netting and try to make their escape, while others would at once begin to puncture the fruits. Five days after the cover had been placed over the tree it was removed again and the fruit exposed. The following morning I visited the tree and noticed several parasites at work, as well as some flies yet puncturing the fruits. The second day another visit was paid to the tree, when dozens of the little parasites could be noticed busily at work depositing their eggs in the infested fruits. I then placed a negro in charge of the tree, with instructions not to let anyone remove any fruit from the tree, and all the fruits which would fall to the ground would be picked up and placed in boxes. On the tenth day after the tree had been covered I picked all the fruit from the tree and placed in shallow boxes. Meantime I collected some other fruits containing maggots, and a lot of the Staphylinidæ beetle. On the eleventh day after the tree had been covered, I sailed from Bahia for Southampton per the "Nile," and had in all eight packages of infested fruits, and three packages containing Staphylinidæ beetles. One of the latter-mentioned packages was at once placed in the refrigerator of the steamer. In this package there was no food placed in for the beetles to feed upon. Another package, in which was placed some oranges infested with forment-flies for the beetles to feed upon, was also placed in cold storage. The third package of these beetles was in a glass jar and were kept in my cabin and given food from day to day. The packages containing the infested fruits would be looked over every morning, and the maggots which had pupated removed and also placed in refrigerator, and by June 9th all had pupated except a few in the caja fruit, which were yet feeding. These were placed in the refrigerator without removing them from the fruit, as I did not care to land in England with any loose maggots. One small package which contained infested fruits

was kept in the cabin, and the maggots were doled out to the ground beetles.

On the evening of June 10th, I reached London. The box in which I had placed the fruit-fly pupa, was at once placed in cold storage, and the packages containing the beetles were taken to my room at the hotel and opened. In the package where no food had been placed, only three beetles were found, and the package which contained the oranges infested with forment-flies, seventeen live beetles were counted. I discovered then that these beetles had turned cannibals on the voyage and had in the absence of food destroyed one another. Those which I had kept in my cabin and given a little food every day were all alive, and in with them I placed the twenty live ones from the two other packages. By this time I had no more maggots to feed them with, and it was soon noticed that they began to attack one another, and I then realised that without food I could not expect to reach Australia with any of them alive. I then began to make some experiments by placing some raw meat cut up fine in the jar, this, as well as some ripe fruit, was rejected by them. I then engaged a cab and drove to various butcher shops in search of blow-fly maggots, and after more than a half day's driving I succeeded in securing about fifteen half-grown maggots; these were placed in the jar and at once seized and devoured by the beetles, and in less than ten minutes every maggot had disappeared. Next I visited the wholesale meat markets, and there was informed by one of the butchers that Peek & Son, Gray's Inn, would very likely be able to supply me with maggots, or gentles, as they are called there. Calling upon Peek & Son, I found they were dealing in fishermen's supplies, and sold blow-fly maggots for bait, but had none on hand at the time, but requested me to call the next day, which I did, and secured about two gallons of maggots, for which I paid 8s. Returning to the hotel I placed about two hundred of the maggots in the jar which contained the beetles, and in less then two hours not a single maggot was to be seen. The balance of the maggots were packed in a box containing moist sand, and placed in the refrigerator of the "China" upon my arrival at Marseilles, together with the package containing the pupa of the fruit flies.

During the voyage from Marseilles to Fremantle, from one to two hundred maggots would be fed to the beetles daily. At Port Said, I visited the fruit market where I had no difficulty in obtaining a good supply of fruit fly maggots, more than two-thirds of the apricots exposed for sale being infested with maggots. A few of these maggots were placed in a tube, and the flies that issued were the same species as we have here. The infested fruits, I was informed, were grown in Turkey.

The journey from Bahia to Fremantle occupied 46 days, and all the insects were in splendid condition upon their arrival, only four of the *Staphylinidæ* beetles having died after leaving London. The others were at once liberated in one of the Perth gardens, where they would be most likely to find food. The fruit fly pupa

were at once removed from the packing box and placed in a breeding jar, and a few hours later a few fruit flies began to issue, and also some of the Ichneumon parasites. Pupa which had been parasitised could be detected at a glance, they being of a dark brown colour, while those which had not been parasitised and contained flies were of a light brown. After being separated, a little over 200 pupa containing parasites were obtained, and some 50 odd being healthy were destroyed by burning them. The others were divided into two lots, one portion being placed in the Government refrigerator in order to try and keep them in a dormant condition until such time as there will be more fruit fly maggots for them to work upon than there are at present during the cold weather, the other portion being kept in a warm room and the parasites liberated as fast as they issue.

Before concluding this report, I wish to state that in Brazil I failed to find any trace of any parasites upon the eggs of fruit flies, and fruits once punctured in that country by any of the various species of fruit flies is doomed to destruction. The parasites attack only the maggots, and this while the latter are yet feeding inside the fruit, and in all stages of development. The egg which the parasite has deposited in the living maggot does not hatch until after the maggot has obtained its full growth and pupated. When this takes place, the larvæ of the parasite eats out the inside of the fruit fly pupa, and uses the pupa shell as a covering for itself to pupate in.

The *Staphylinidæ* beetles beyond question destroy the major part of the fruit fly maggots in Brazil, and also destroy a large number of the parasites as well, eating every maggot with which they come in contact, not discriminating between those parasitised and those that are not.

In Brazil, the same as in India, Nature's forces of controlling these destructive fruit flies is complete.

Should it, from any cause, happen that the present importation fail to establish themselves in this State, we will know how and where to secure them in the future. Once these parasites and beetles become established in the State, there will then be no more fear of *Ceratitis capitata* than there is of the most harmless insect in the country.

CATTLE: THEIR BREEDS AND MANAGEMENT.

By R. E. WEIR, V.S., C.I.S.

The following article is taken from the notes of a lecture given by Mr. Weir during the past month:—

SHORTHORNS.

The cattle which have been the most famous as a breed in England, which have received the longest and closest attention of breeders and improvers, which have commanded prices singly and in herds far above all others, and which have made the most general impression upon the live stock of the country during the nineteenth century, are the Shorthorns or Durhams.

The breed was probably originally formed several centuries ago by crossing the aboriginal British cows with large framed bulls imported from the Continent. Early Shorthorns were good milkers, and it may be presumed that they in part inherited that quality along with the shortness of horn from their continental ancestors.

Little is known of the breed, except from uncertain authority of tradition down to the early part of the eighteenth century, though it is only right to infer that long before this time great care and even skill had been bestowed upon it. The earliest records show that purity of breed was fully appreciated, and this important fact could not have been universal without previous experience and attention.

The great county of York, extending along the Eastward coast of England, from the River Humber to the Tees and Westward almost to the Irish Sea, has the honour of being the seat of the most noted examples of improvement in British cattle. The aim of all the improvers of Shorthorns has been to secure early maturity, size, form, and beef-producing qualities. "All is useless that is not beef," was the motto of an eminent breeder, and he has had many followers. Thomas Bates is the most noted of a few who have seemed most anxious to retain good milching capacity. The Shorthorns are a beef breed and have been so for generations. They are classed among the beef breeds in all the great exhibitions, and as a breed do not pretend to be general purpose animals. But there have always been good dairy cows amongst them, and in England strains and families have been kept somewhat distinct and are known as "Milking Shorthorns."

In point of size the Shorthorns are probably the largest among pure breeds of cattle. In their modern form they are not so tall, and have not so large a frame as some of their ancestors, but the lower, blockier, fuller form maintains the maximum weight. Bulls

ordinarily weigh a ton and more, sometimes running to 3,000lb. Mature cows range from 1,200 to 1,600lbs.

The colour of the breed has always been red and white with various blendings of these two. Many of the best among the early Shorthorns were pure white, but that colour has lost caste, and the roan in England, and the red in America are the favourite colours. The head is comparatively short, broad, finely finished, and attractive; the nose, lips, and eyelids flesh-coloured and free from any dark markings; eyes clear, bright, yet mild; ears thin, delicate, and creamy colour inside; horns are short and blunt and more or less curved downward, of a waxy-yellow throughout, free from black tips, laterally flattened and wide apart at the base; the neck is short and firm in the cow, heavy and well crested in the bull. The lines of the body are straight with well filled points, broad level back, full loin, heavy thick buttocks, wide apart; brisket is wide and full; legs rather short, close, fine boned, and well proportioned to size of body. In the milking strains the cows are rather more rangy and angular in outline, with large hairy udders, and good-sized teats, well placed. The skin over the whole body is flesh-coloured, soft, and oily to the touch and covered with fine short hair. The animals are quiet and kind in disposition. Nearly all show evidence of long continued high breeding, and this has been carried to such an extent in many instances as to become more or less delicacy of constitution. Although now latent in most lines, there seems to be a dairy quality inherent in the breed, which some careful managers are able successfully to develop and propagate. The Shorthorn milk is of good quality, rather above the average: the fat globules are of medium and fairly uniform size, so that cream separates easily. It is, however, rather pale in colour. Herds of 40 cows have averaged 209lbs. of butter per year.

POLLED DURHAM.

This is a breed which has practically originated in America, and although largely of Shorthorn blood the old familiar muley cow of native stock of the country, often a brindle in colour, was used to a considerable extent in the work of building up the breed and breeding out the horns; but having served its purpose this common blood is now rather despised. As to the size, colours, and general appearance, the polled Durhams answer perfectly to the description of the typical Shorthorn of the beef form, without the horns. Red is the colour preferred and prevailing. They should be, and usually are, classed as belonging to the beef breeds, yet so many animals of dairy excellence appear amongst them that they deserve this mention. In their dairy capacity, they may also be said to practically duplicate the milking Shorthorn, so that separate description is unnecessary.

RED POLLS.

This is another of the comparatively new breeds, as its independence has been recognised during the last half of the nine-

teenth century, and is another without horns. Red polled cattle resemble the Devons almost as closely as the polled Durhams resemble the Shorthorns, yet the two red races are probably not closely related—the Devons are natives of the Dartmoor region in the South-Western portion of England, and the Red Polls had their origin in the Eastern plain, North of the River Thames, and particularly in the counties of Norfolk and Suffolk. The progenitors of this breed were the little, old, red horned cattle of Norfolk, and the Dun or Mouse-coloured Polled animals of Suffolk. Arthur Young, in his survey of Suffolk, published in 1794, says there is barely a dairy of any consideration in the district which does not contain cows which give in the height of the season eight gallons of milk per day, and six gallons is a common quantity among many for a large part of the season. The animals of this breed are about the same size as Devons, and being of the same colour and of the beef form, the resemblance is still greater. The absence of horns and the change thus caused in the shape of the head, which assumes a comparatively high and sharp crown, with a tuft of hair upon it, is the only noticeable distinction. They are strong in constitution, hardy, good grazers, active in movement and quiet in disposition. In general appearance they are of the beef type, blocky, round, full, smooth and fine boned. Their aptitude for making beef seems to be greater than making milk.

AYRSHIRES.

This is a breed of dairy cattle peculiar to Scotland, and from that particular shire of Scotland they are supposed to have obtained their origin from the Holderness breed, and by judicious breeding have resulted in one of the best, if not the very best of the dairy kind. The shapes most approved are as follows:—Head small, but rather long and narrow at the muzzle; eyes small, but smart and lively; horns wide set on, and inclining upwards; neck long and slender, tapering towards the head; shoulders thin; fore-quarters light; hindquarters large; back straight and broad behind, the joints rather loose and open; carcase deep and pelvis capacious, and wide over the hips, with round fleshy buttocks; tail long and thin; legs small and short, with firm joints; udder capacious, broad, and square, stretching forward, and neither fleshy, low hung nor loose; the milk veins large and prominent; teats short and hanging perpendicularly and at considerable distance from each other; skin thin and loose; hair soft and woolly; the general figure compact and well proportioned. They are characteristically not a fleshy animal. The Ayrshire possesses those qualities indispensible to a dairy cow, namely, tameness and docility of temper, some degree of hardiness and soundness of constitution, and a moderate degree of life and spirits. She also yields a large quantity of milk of an oily or caseous nature, and after having done so for several years is as valuable for beef as any other breed of cows known, the fat mixing through the whole flesh, and fattening rapidly. It is estimated that two Ayrshires will give as much milk as three Shorthorns with a lesser food supply.

JERSEYS.

Lying in the English Channel, some 30 or 50 miles from the Southern extremity of Great Britain, is an interesting group of islands, the largest of which, but thirteen miles from the coast of France, is the Island of Jersey. This is the home of one of the most important and widely distributed of the dairy breeds of cattle. The foundation of the race developed there was probably from the stock of Normandy and Brittany, but early in the eighteenth century steps were taken to prevent outside cattle coming to Jersey, and in 1779 a law was made, which has since been rigidly enforced, prohibiting, under heavy penalties, the landing upon the island any live animal of the bovine race. Jerseys have, therefore, been purely bred with certainty for a longer time than any other breed of British origin. The soil of the island is extremely fertile and the climate mild. The cows remain out of doors for the greater portion of the year, and are seldom allowed to roam about, being either tethered or led, principally by women. Very little grass is fed, but in addition to grass they are liberally supplied with roots, chiefly parsnips, which are abundantly grown for this purpose. Under these conditions a highly organised, delicate, and gentle race of cattle have developed. It is at the same time a race of inherent constitutional vigour, and is particularly free in its highland home from contagious congenital and other diseases. A great number are annually exported to Great Britain, America, and other countries. Jerseys are the smallest in the average size of any of the dairy breeds, cows ranging from 700lbs. to 1,000lbs., and the bulls from 1,200lbs. to 1,800lbs. In colour this breed varies more than any other. It is a mistaken idea with many that they must be solidly coloured. There are pure registered Jerseys of all shades of brown to deep black, and the various shades of yellow, fawn, and tan colours to a creamy white, in either large or small patches, and on any part of the animal. Bulls range much darker in colour than cows, but there are always signs or markings about a pure Jersey or a high-grade, and something in its appearance, hard to describe, by which the blood is unmistakeably shown. The head of the Jersey is small, short, broad, lean, and generally dished. The muzzle, including the upper lip, is black or a dark red colour; the eyes are wide apart, large, bright, and very prominent; the horns small, waxy, with thin shells, and often black tipped and much crumpled; ears small and delicate; neck small, clean, and fine; legs the same, or rather short; body well rounded, with capacity for food and breeding; tail long and fine, with a full brush, often leading to the ground; the udder of good size, more pendulant than in the Ayrshire, and with quarters more distinctly defined; teats sometimes small and conically inclined. The square close udder is well nigh perfect; milk veins highly developed, tortuous, and knotty.

HOLSTEIN.

The strongly marked black and white cattle of North Holland and Freesland constitute one of the very oldest and most notable of

the dairy breeds. Holland has been noted for dairy products for at least a thousand years, and the great bi-coloured beasts upon which this reputation has been based have been slowly but surely developing their present form of dairy excellence. The large frame, short bone, abundance of flesh, silken coat, extreme docility, and enormous milk yield of the Holstein results from the rich and luxuriant herbage of the very fertile and moist reclaimed lands upon which the breed has been perfected, the uncommonly good care they receive from their owners, and the close association of people and cattle. The preservation of the Fresian people and their continued adhesion to cattle breeding for more than two thousand years is one of the marvels of history. During winter the cattle are carefully housed and groomed, without being turned out of doors. At the opening of spring, or when the grass is sufficiently grown, they are taken to the fields and cared for in the most quaint manner. Canvas covers protect them from the sun, storms, and insects. The grasses upon which they are fed are rich and luxuriant. This method is continued until the animals are six or seven years old, when they are considered to be past the period of dairy profit, and are sent to the slaughter yards.

The striking features in the appearance of this breed are the colour markings of black and white, and the large size of the anim s in both sexes. The head is rather long, narrow and bony, with bright jet quiet eyes and large mouth and nostrils; the horns are small and fine, often in-curving, and frequently white, with black tips; neck long, slender, and tapered; the back line usually level, the hips broad and prominent; the legs appear small and long; the tail fine, and a white brush is required. The udder is often of extraordinary size, filling the space between the legs, extending high behind and well forward, with teats of large size and well placed. The breed is famous for enormous milk producers; cows giving five to seven gallons per day are regarded as average milk producers. The milk of the over-large producers is generally pretty thin, low in percentage of total solids, and deficient in fat. The breed has been a favourite for milkmen doing a milk supply business, but in numerous cases thin product has been below the standard fixed by State and municipal laws. On the other hand, there are some families which give milk of more than average richness, and are profitable butter producers, making from 15lbs. to 20lbs. butter per week.

NORMANDIES.

These are natives of certain parts of France, where they are much esteemed for dairying qualities. They appear, however, to lack affixity of type, and are a coarse rough race, from which close selection must be made to get animals which are at all attractive. The animals are sometimes brindled and sometimes spotted, the colouring being red or reddish brown; the head is coarse and rather long, with large muzzle and mouth; the body is long, deep, and irregular in outline, with narrow quarters, and covered with

thick heavy skin. They have large pendulant udders and long wide spread teats. They are believed to be particularly hardy and free from disease. They are also claimed to be a general purpose cow, being as good for beef as for the dairy.

HEREFORDS.

These are principally distinguished by their white markings and red appearance. They belong to the beef class, not being considered profitable for dairy purposes. The great feature about them is that they fatten quickly and at an early age. They are usually slaughtered at two years, and are considered unprofitable for farmers to keep, especially for a longer period than three years. They are quiet, docile animals, and fatten readily when other animals would find some difficulty in securing a living. The beef is considered to be a little coarse, but the fat mixes well with the fibre, giving it a mottled appearance.

DEVONS.

This breed originated from Devonshire, England, and are cultivated for their beautiful form, activity, and their aptitude to fatten, which is unrivalled. These are known by their small head, yellow muzzle, and curly hair; the thick neck and well-developed chest. A great essential in beef animals being the depth of girth, which in this class is very well developed. The barrel is also deep and well rounded, being well ribbed up, leaving very little space between the hips and ribs; this being regarded as a healthy constitutional sign and a propensity to fatten. The loins should be wide, the thighs full and long, and close together when viewed from behind; legs short and small; hide thin and mellow, but not too loose, and particularly well covered with fine soft hair. The favourite colour is a blood red. They are a hardy class of animal with an aptitude for putting on condition; as dairy cattle they are inferior to other breeds. The milk is, however, good, and yields more than the average quantity of cream and butter.

BREEDING.

Before a farmer or grazier selects his herd, he should first be certain that ample provision has been made for food supply, as without this essential the success he anticipates will not be realised. Good grazing land, free from poison plants, is essential in this direction. This being decided, he then selects the class of animal most suited to his requirements. If a beef animal is required, the best of its class should be secured. If, on the other hand, a dairy herd is to be selected then the class of animal most suited to his particular case will be necessary. If, for instance, a butter cow is required the Jersey will naturally be chosen; or if an animal giving a large supply of milk is desired, the Ayrshire may prove the most suitable. Whichever is chosen, the best of its kind, com-

mensurate with the capital at the disposal of the purchaser, should be secured. The animals should also be purchased young, yearlings or two-year-olds being the most desirable, and these should be from a pure herd. In this way the animals will not be pampered up for sale, and the capital outlay will not be so great, besides which, with careful management, the animals will grow in value and soon give returns. Having thus secured his breed, it will be necessary, as time goes on, to take particular notice of the various animals and carefully select the best for breeding purposes. He should be guided by the points already described for dairy cattle. The cow of fine, quick, nervous organisation, with well-developed udder and healthy teats, will probably prove a good mother, just as she should prove a good milker. As an indication of this nervous and motherly organisation, it is well to take special notice of two points of quality, viz., the setting on of the head to the neck, and expression and movements of the facial features. The firmly moulded and tapering neck is, as a rule, the index of a good nervous system. The eyes and general facial expression are none the less important. A good mother is generally a nervously organised cow. In the race for the survival of the fittest it would generally happen that the cow which is on the alert to perceive the first sign of danger and quick to provide some means of escape, would be the one that safely brought her young through that period when they could not take care of themselves. In some instances the progeny of a promising looking cow turns out unsatisfactorily. This animal should be immediately discarded as a breeder and another put into her place. It does not usually take long to show the value of the progeny from each breeding cow. Fats are known by their rapidity of growth and by preserving good condition, whilst the milking strains soon show the valuable points of their parents. Regularity and method should be observed in detecting the faults of a herd, and by aiming at getting rid of defects or disease amongst a herd some degree of perfection is ultimately secured. The chief factor in a dairy herd is to secure cows which will yield a good and regular supply of milk. Cows should produce 200lbs. to 250lbs. of butter yearly, and from 500 to 600 gallons of milk in the same period. Having a knowledge of what each cow consumes and produces the owner can rapidly set to work to find out the cows that fall below, and settle the question as to whether the feed or breed will bring the herd up to the standard. The opinion has been advanced that cows are like machines, and will return what has been put into them, but that is true only to a certain extent. It has its limit in some cows, which is soon reached. A cow is best after her third calf, and is then capable of producing a certain quantity of butter, and no matter how she is fed, she cannot give beyond that. It is, of course, possible, with judicious feeding, to increase the quantity of milk, but not beyond a certain point, and the successful man is he who knows just what quantity of artificial food produces that result, and that to give more would be a waste. The quantity of dry food required to sustain life is generally placed at 16lbs.

REST NECESSARY BEFORE CALVING.

Great diversity of opinion exists upon this point. Some maintain that an animal should be milked right up to the time of calving. A great deal depends upon the condition of the animal. A month at least should be allowed, even with the highly fed and good conditioned animal, and with the poorer ones, when feed is scarce, three months should be allowed. The ideal cow should not only milk well after calving, but should continue to do so for some seven or eight months, after which she should run down in her milk pretty quickly until the end of the ninth month, when she should be dry, or nearly so if she is in calf within the year. Some cows milk particularly well immediately after calving, but do not maintain the same good results throughout the season, while others give a fair average and maintain the supply during the milking period. Of course, a great deal will depend on how the animals are fed, but the one that keeps up the regular supply will undoubtedly give the best results at the end of the nine months.

THE CALF.

The cow requires every consideration at the time of calving, as exposure to cold or wet at this period is often fatal. At the conclusion of 275 days the ordinary gestation is close at hand. The cow should be kept in a small paddock containing shelter until the event is over. If the cow is a beef animal the calf will be allowed to suck and get all the supply of milk. If, on the other hand, the cow is of the dairy breed, the calf should be immediately removed and reared by means of hand feeding. A calf which is intended for breeding or milking purposes should receive the natural food, that is, new milk for a period of one month to six weeks, when it may be placed on skimmed milk and a proportion of meal given in a warm condition. A gallon of milk per day is about the necessary quantity for a newly born calf, and about three gallons when about six or seven weeks old. At about two years old the heifers should be sufficiently matured to breed from, although in some instances, such as the Shorthorn breed, this may be attained six months earlier. During the breeding season, cows should not be left in too rich a pasture, and should arrive at the period of calving in fair condition only. A few days after calving, dairy cows should be given rich artificial food until such time as a plentiful supply of grass is provided. Food should be rich in nitrogenous and non-nitrogenous matter, ground beans being an instance of this class: a quantity mixed with scalded chaff and bran forms a stimulating food. When grass becomes plentiful the food should consist of this alone, as a better milk supply is always provided from natural herbage.

BULLS.

It is always advisable to secure a pure bred animal, and strong constitution should be the main object in selection. He should always be kept in good condition without being over fat. Pampering

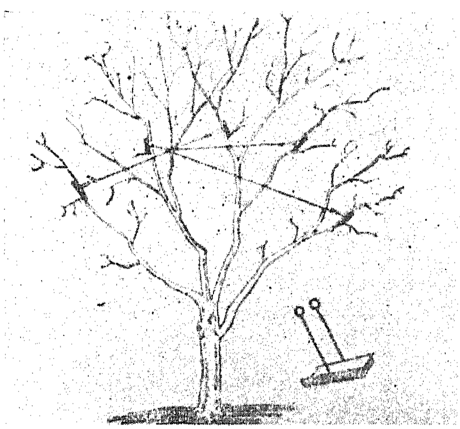
is to be avoided. A certain amount of hand feeding is necessary before the season begins, and care should be taken not to overwork.

POLLED ANGUS.

This is a breed of cattle which is much cultivated in Aberdeenshire, Scotland, their recommendation being their hardiness to withstand cold weather and in finding sustenance on the roughest of pastures. They mature and fatten very early, their beef being considered the choicest of all, and by good judges takes second place to the Devons in respect to the percentage of killing weight to live weight. They are large framed, good-proportioned cattle, of a hardy constitution and tractable. The top line is wonderfully true and the ribs splendidly arched.

TREE BRACE.

The illustration here shown is taken from a Californian paper. It is a simple and efficacious way in which to brace up an overladen fruit tree. Instead of using rope or wire, which injures the bark of the tree, a shield, made of very soft wood or cork when



A good way to brace a tree.

obtainable, is used to lay next the branch to be supported, from this, wire is taken to a shield on to a limb on the opposite side of the tree. In case of hard wood being used, then a little bagging, folded two or three times, should be placed between the shield and the limb.

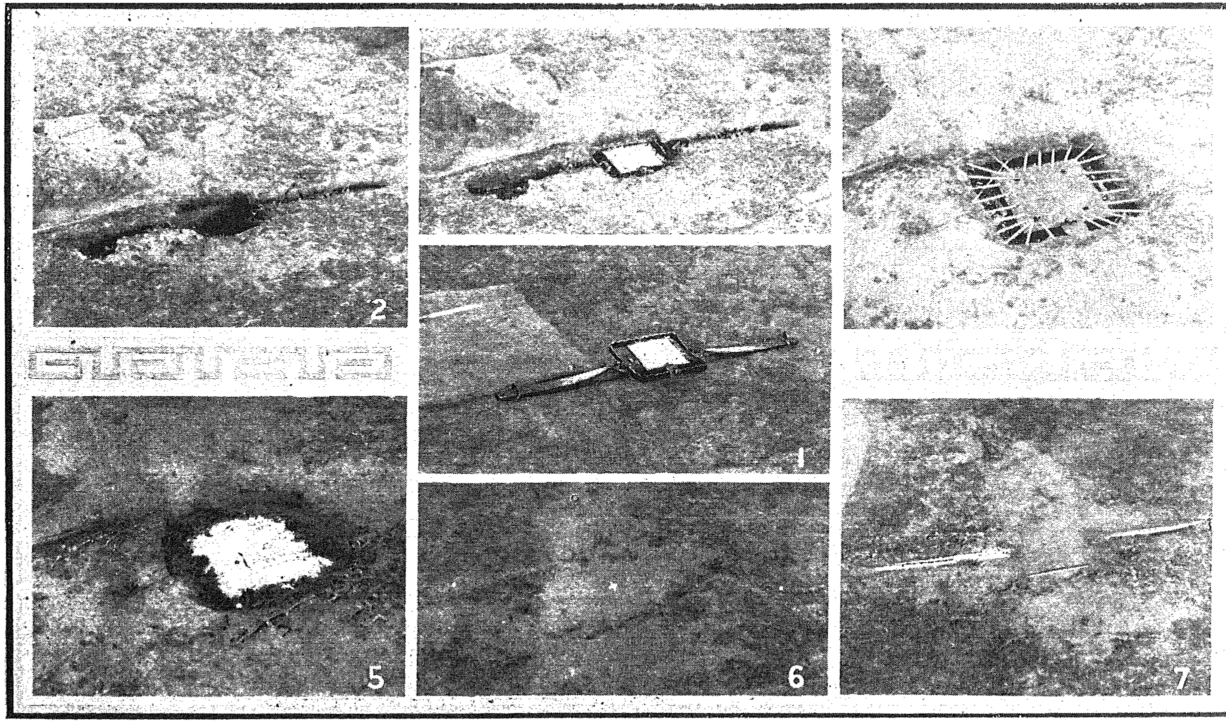
DINGO TRAPPING.

The following instructions how to trap native dogs are taken from Mr. Ross's method, and, with the illustrations and instructions carefully followed, any person should be able to trap any ordinary dingo.

Of course when a dog becomes very cunning it requires much more skill to catch him, and this is only obtained by experience.

To catch a dingo it is first of all necessary to allay all his suspicions of danger, either by sight or smell, about the ground where the trap is to be set indicating that this has been tampered with in any way. The simple way of setting a trap without its being hidden, with a bait on it, will only catch very inexperienced dogs. The trap must be buried in such a way that it will easily snap, and the soil must be replaced in such a way that it does not differ from the surrounding country. A cutting is made in the ground exactly the size of the trap, and is then carefully covered over, as will be more fully described later on.

The first thing to do is to find the beat of the dingo. To anyone familiar with the country this should not be a difficult matter, as nearly all dogs have regular tracks on which they go regularly. It may be perhaps only once or twice a week, or possibly once in two weeks, as some dogs travel about much more than others. Nearly all dogs have regular scratching places, and if the beat cannot be found the scratching place is the next best place to set the trap. When you have found the dog's beat or his scratching place be very careful not to approach it too closely, otherwise he may see your tracks or smell your scent. On no account ever walk in front of the place where the trap has to be set. When you have decided on the exact spot in which to place the trap, which, if you have found the dog's regular beat, should be on it, take a bag and put it carefully down almost on a level with the dog's track, and upon this bag stand or kneel, and on it also put the soil which is taken from the hole in which you bury the trap, then take the trap and set it down at right angles to the end of your bag, having the plate exactly in the dog's track, and always keeping the heel of the trap next to the bag, then with a knife carefully mark the outline of the trap; put the trap to one side now, and with your knife cut all round the marks you have made. Cut out the ground now on the inside of your marks as neatly as possible, taking out the centre of where the trap is to be first, and put all your loose soil upon the bag upon which you are kneeling. When doing this be careful not to rest your hand upon the ground anywhere near the dog's track, but after you have taken the soil out from the centre you can rest it there while you are taking out parts for the springs. When you have the hole sufficiently large and deep, set the trap, and put it carefully in the ground so that the plate will be a ¼-inch below the surface, then fill in over the springs very lightly.



Dingo Trapping: The way to set a trap. (*See* Letterpress, Page 82).

Use a little horse manure or light leaves to go round the side of the plate so as to prevent the soil from getting underneath them, as this must always be kept so as to allow the plate to drop when the dog's foot goes on it. Next put the soil carefully all around the jaws of the trap, and be very careful to see that there are no small stones or bits of wood in the soil that might possibly get in the jaws near the spring, and thus keep it from closing tightly. Get a light twig that will reach across the edge of the jaws diagonally, and place it carefully underneath the plate, resting it on the opposite corners of the jaws, so as to take the weight of the soil off the plate. The twig must be very light and easily broken so that when the dog puts its foot on the plate the twig will snap and let the plate go down; then take some small twigs about the size of safety matches and place them from the edge of the plate to the edge of the jaws, as shown in illustration. When this is done get a piece of paper the size of the centre of the trap, making one or two tears about the centre of the paper so as to allow the air to escape. In the summer time the paper may be wet so as to make it easy to break, then take some sand or earth and work it around the inside of the trap, taking care to spill none outside. Then take a small stick and work it gently in the centre of the trap so as to bring the soil on the plate on a level with the surrounding soil. Be careful to put the same kind of soil or sand on the top as is on the surrounding surface. By blowing over the surface or by using your hat as a fan, the place where the trap is concealed may be quite easily hidden, so that it cannot be distinguished. Next take two or three twigs or sticks about a ¼-inch thick and lay them along where the springs are concealed, to within about a ¼-inch off the jaws of the trap, then get a little rubbish, such as decayed vegetable matter, and place it on the end of these sticks level with the jaws, then get another twig about the size of a small penholder and place it just on the side of the trap over the catch of the tongue, so as to keep the dog from putting his foot on the tongue, to make sure that he will put his foot on the plate of the trap, as a dog will never put his foot on a little bit of stick like this if there is a smooth place for him alongside. It is advisable to put two small sticks, one at each end of this last one that has been put down, in case it should be shifted by lizards or small animals running over it. This stick that is put down about the size of a penholder should be a little longer than the plate itself. The jaws of the trap should never be very sharp, the teeth should be either blunted or wrapped on the ends with wire so as to prevent it cutting the dog's leg off, and thus allowing him to escape. The kind of trap that Mr. Ross recommends is the 7-inch double-springed horseshoe trap with the falling plate, and he specially recommends anyone to avoid using the balance plate. (Horseshoe traps can be purchased at about 7s. each.) If a dog should happen to get caught and get away, the next time he comes along he will look out for the small sticks that have been set about the surface of the ground over the trap. To catch such a dog the best way is not to use sticks. All the dirt that has been taken from the hole and has been put on the bag and not replaced should be gathered up in

the bag and taken some little distance and thrown away, but on no account leave any lying about where the trap has been set. Put nothing whatever in the way of bait on the traps, as this only attracts native cats, ants, and other small game, and may cause the trap to be snapped without catching the dog. If a dog runs a road where it is not safe to set a trap, the trap may be set on one side in the same method as before-mentioned, and the dog's attention attracted to the place by some of the dung and urine of other dogs. A little distance in advance of where the trap is set a sapling should be laid down in a slanting direction, with the nearest end towards where the trap is; the fact of the sapling being laid down will attract the dog's attention, and instead of jumping over it he will probably go round the end, and by so doing would probably smell the dung and urine laid as a lure for him. The dung should be put just on the heel of the trap or back of the tongue. It should be exactly in this position, as when the dog goes to smell it he will then place his fore-feet exactly over the plate. In all cases be careful to remember that the heel or back of the trap must be kept next to the bag upon which you stand or kneel. When setting a trap on the side of a road like this, be careful on no account to walk in front of it but keep at the back, and use the same precautions that were given in the first instance. It is better not to chain or wire the trap in any way, as even if the dog does make off with the trap it would be very easily tracked. The illustrations will show the different methods from the marking out of the trap until the operation is complete. They are numbered from 1 to 7, and may be briefly referred to as follows:—Fig. 1, trap laid down ready to mark out ground; fig. 2, shows the hole made to place the trap in; fig. 3, trap in position; fig. 4, pieces of thin sticks or twigs to support paper; fig. 5, paper placed over plate in order to prevent dirt from getting underneath; fig. 6, trap covered and dirt dusted over it; fig. 7, sticks laid down on finished trap.

SEPARATING BUTTERMILK.

A correspondent writes asking:—"How can I make the buttermilk separate from the butter when the weather is warm. I have often to throw the cream away, which is a serious loss." In referring the matter to the Acting Director, Mr. Crawford replies:—"It is sometimes a very difficult matter to deal with after the cream has been allowed to become warm. It is a good plan to add a little salt to the water. The simplest way, however, is to first cool the water in water-bags, and then, so soon as the butter breaks, and grains are formed, and, before it is churned into lumps, pour the cold water in and continue to gently churn, adding several waters, but do not allow the grains to become a mass.

SHEEP: THEIR BREEDS AND MANAGEMENT.

By FRANK L. FAULKNER.

The following article is taken from the notes of Mr. Faulkner, the field officer of the Department of Agriculture, of a lecture given by him last month:—

In introducing the sub ect he said, that the domestic sheep of the world might be roughly classed under three headings, viz., long, middle, and short wools. Apart from these altogether was the fat-tailed sheep of Africa, that produced no wool and was noted for its peculiar, almost abnormal, development of the tail. The chief long-wools were Leicester-Border, Leicester-Lincoln, Cotswold, and Romney Marsh.

THE ENGLISH LEICESTER

was the first breed of sheep to undergo a really systematic course of breeding and selection. They were first taken in hand by Robert Bakewell, the well-known stock breeder, in 1755. The result of Bakewell's work was the formation of an improved type of sheep of great carcase and with great fattening properties; but, unfortunately, the wool was neglected. However, the fact of the wool not being taken into account was no doubt largely the reason why the sheep was such a success as a mutton sheep. The fact undoubtedly applied to all breeds of sheep that fine quality and weight of wool were always produced at the expense of the carcase and economical fattening properties. The success of Bakewell's breeding was best described by referring to the demand for his sheep at the time. From letting rams at a few shillings for the season, the demand for their services rose until in 1789 he obtained, 1,200 guineas by the letting of three rams, and 2,000 guineas for seven others. The Leicester was best fattened at 12 to 15 months, when the carcase weighed 80lbs. to 100lbs. Of the disadvantages of Leicesters, he mentioned that they were liable to lay on fat too thickly, and thus the mutton was not of so good a quality, being coarse and tallowy. The breeding ewes also were liable to get too fat, which rendered them less prolific. The great value of the Leicester was in its excellence for crossing purposes in the production of mutton. In England it was used largely by farmers for crossing with the Cheviot and the black-faced mountain sheep with very good results. For these colonies the Leicester-Merino should make a useful sheep for butchering purposes, and the cross with the Merino blood would at the same time give a better class of wool and mutton and a sheep more adapted to local conditions.

THE BORDER LEICESTER

in many points was similar to the English Leicester. Apparently the Cheviot sheep had been used in its improvement from the English, which gave them their stylish gait, white face, and fine bone. It had wonderful girth and barrel, and was tremendous across chest and shoulders—a point that tended to make the hind-quarters look light. The belly line was rather high, which made it look leggy, but in reality it killed much better than it would appear to. Like that of the English Leicester, however, the mutton was rather coarse and tallowy.

LINCOLNS.

The original breed was coarse, large and bony, but with a heavy fleece of bright, long, lustrous wool. It was foremost of the long-wool sheep for wool with a staple often 8in. to 14in. and even up to 21in. long; the fleece weighing from 8lb. to 14lb. up to 30lb. They were the largest of all sheep and killed up to 25lb. or 35lb. a quarter, and been killed to dress 360lb. In their general features they were similar to the Leicester, as the latter had been used to improve them, but they were larger, with a large coarse head. The head was a great disadvantage, as in crossing with small or young ewes there was a liability to a large loss in the lambing. The Lincoln, however, was very popular in the colonies, no doubt owing to its having been introduced first of all the English breeds.

COTSWOLD SHEEP.

This was a heavy, large-framed sheep, but coarse and not so shapely even as the Lincoln. It has not made much progress in the colonies, and was hardly likely to.

ROMNEY MARSH OR KENT SHEEP.

This breed came from the flat, bleak district of Romney Marsh. They thrived on wet, cold, humid, undrained country, where almost any other breed of sheep would succumb to the effects of footrot, fluke, and ailments common to such country. Originally the Romney was one with a big head, narrow chest, flat sides, and big belly, but with the one redeeming feature, *i.e.*, that of being very hardy on its own country. The Romney of to-day was of large size (though not so large as the Lincoln) and shapely. The wool was of fair staple and good weight—not so long or lustrous as the Lincoln, but of finer quality and more character. All round it was not as coarse a sheep as the Lincoln. It was used to cross with the merino, and gave very good results on country where sheep were subject to footrot, and the wool from the cross toned down and gave better quality than any other of either the long or middle wool breeds.

Other long-wool sheep were the Devons, Wensleydale, and the Roscommon, but they were all very similar to the Leicester and Lincoln; that for all purposes they were practically the same, and

of course their merits affected their popularity. The middle-woolled were the Ryeland, the Southdown, Shropshire, Hampshire Down, and the Dorset Horn. By contrast with the long-wool breeds the Ryeland and the Southdown might be spoken of as short wool, but neither in quality or length of wool did they compare with the merino, and, being essentially carcase sheep, were classed as such.

RYELAND SHEEP

were one of the oldest of English breeds of sheep, and at one time became almost extinct. Latterly, however, what remained had been improved by the Leicester. It was a compact, hornless, white-faced sheep that matured quickly and fattened readily, thus being a good strain to produce fat lambs. The wool approached the Merino nearer than any other of the English breeds, cutting a fleece of 7lbs. to 8lbs. The Ryeland had up to now not been imported into the colonies, but its reputed good qualities should make it worthy of a trial.

THE SOUTHDOWN

was the most shapely of all breeds of sheep, being compact, symmetrical, and deep-fleshed. It had been improved by selection to almost an absolute model. The bone all through was very fine and clean, and the sheep was mutton right down to the knee and hock, with a beautiful thigh and forequarter. Wethers killed up to 30lbs. a quarter. There was a very small percentage of offal, and the mutton was dark, close-grained, and juicy. It was the best butchers' sheep of all the Down breeds. It was used to and thrived on short, sweet pastures and well-drained or limey soils. It was a very useful sheep for lamb-breeding, as the lambs developed quickly, fattened early, and assumed the nuggety, blocky shape that sold well. For fat lambs the pure breed would give excellent results, and they were also good for crossing with the Merino ewes. The Southdown was undoubtedly par excellence the sheep for fat lamb-breeding where conditions were suitable.

SHROPSHIRES.

They were the most popular sheep in England and in the colonies for breeding fat lambs. They were very prolific, often breeding over 50 per cent. twins. They were very hardy, and could stand poverty of feed well. They stood heavy stocking, but, of course, did not thrive and were not as profitable as when liberally fed. They matured early, and gave a good quality of mutton—better than that of the longwools, but not so good as that of the Southdown. The fleece was much better than that of the Southdown, the sheep being well covered with dense, fair wool, resembling the covering of the Merino. For the colonies the Shropshire had been found to give excellent results for lamb-raising, and in most parts the conditions seemed to suit it very well. The cross with the Merino have seemed to give splendid lambs. The Shropshire would now, no doubt, hold its own, as a number of breeders now had

them, and an association was formed whereby the pedigrees of all good animals was kept and registered.

HAMPSHIRE DOWN

was the heaviest of all the Down breeds. They were used mainly for producing fat lambs, and for the purpose they were very good, giving an early-maturing lamb. They were not so good as the Shropshires, however, as they had a large, coarse head, which made them bad for breeding on young, small, or Merino ewes.

THE DORSET HORN

This was really a Down breed, but it had many distinctive features. It was a medium-sized sheep, with very distinctive curly horns in the case of the ram, and the ewes were generally horned. The head and legs were pure white, and the wool was very similar to the Shropshire in quality, although not quite so heavy. The cross between the Merino and Dorset gave a very prolific and good mother, with a wool of very fair value. They were very early-maturing, and would breed at any time almost, which fact was very useful for lamb breeding. They were essentially a lamb-producing breed, and, as far as they had been tried in the colonies, had given splendid results. They were very hardy, and this, combined with their excellence as mothers and breeders of early lambs, should make them become very popular in the States in the near future.

MOUNTAIN AND FOREST BREEDS.

There were several different breeds that came under that heading. The chief of them were the Black-faced sheep, the Cheviot, the Herdwick, the Limestone or Craig sheep, and the Dartmoor and Exmoor breeds. The Black-faced or Mountain sheep was found on the rough, bleak hills of Scotland and the North of England. Unconfined by fences and innocent of all systems of artificial feeding, it was hardy and active and well adapted to the extremely cold and inclement weather that its natural haunts were subjected to. It was noted for producing mutton of exceptional quality, but it was unsuited for Australian conditions. The Cheviot was found on the lower slopes and better country than that which the Black Face frequented. It was, however, subject to very severe frosts, and during the winter the ground was covered with snow for many months. The Cheviot was a white-faced, long-bodied sheep, hornless, and inclined to be light in the fore-quarter. The wool was fine and short, comparative to the long lashy wool of the Black-face Heath sheep. Altogether the Cheviot was a strikingly active, bold-looking sheep and very hardy, although a degree less hardy than the Black Face. It was a prolific breeder and ready fattener, with good-quality mutton. The Herdwick was a long-woolly, horned sheep from the English lake country. It had a heavy fleece of rather rough and poor quality wool. When young the lambs were very dark, but their black points gradually diminished as they

got older to a spotted mottled face. The Herdwick was very hardy, and gave mutton of good quality.

THE MERINO.

Originating in Spain and Germany this breed has been extensively bred almost all over the world, and with its extension it had been placed in the hands of many different breeders and moulded to suit their ideas until there was almost an endless variety of types —almost breeds in themselves. Notwithstanding these types they had all been bred with wool as the main object, and the merino sheep to-day was the wool sheep of the world. In the production of merino wool Australia stood easily first, although America and Africa were increasing their export very rapidly. The reason for the merino being so very popular was very obvious. Firstly, it is very hardy, and would thrive where other breeds would succumb, standing variations in the temperature and climate well. It was an animal very easily fenced, being quiet and contented, but rather shy and retiring. The wool from the merino was not equalled by any other sheep in the world, not only as regards quality, but in most cases quantity as well. The flesh of the merino was undoubtedly second to none, unless it was the Black-faced sheep of Scotland, being of very fine quality, and if the right class of merino was kept the wethers gave a very presentable carcase of mutton. The ewes, on the other hand, if bred to a ram of the best English breeds, gave a lamb of excellent mutton or lamb producing qualities, and at the same time grew a fleece of very good quality. In selecting and choosing merino sheep, as in everything else, the best animal was that which returned the biggest net profit. The main feature of the merino was wool production, therefore wool should be the main object in breeding and selecting. Naturally, then, one turns to find the sheep that would produce the highest price wool per pound. This was all right up to a certain point, which point would be determined by the class of country the stock had to work on, but it was found that as the quality increased the quantity decreased; also that wool of fine quality in hot climates and severe conditions did not stand. In most cases, then, in the Australian colonies it would be, and was, found that it paid much better to produce a stronger, bigger class of wool that stood the climate better and give bigger returns per sheep. Now, while the weight of the fleece on the sheep was increased, it should not be supposed that the same sheep was fitted to carry it, for to feed and pasture a sheep economically he should be able to travel and do for himself. A great many sheep-breeders to-day were making that mistake. They were

INCREASING THE WEIGHT OF WOOL

on the sheep, covering him with folds and wrinkles from stem to stern, until he could neither see out of his eyes for wool or move for wrinkles. This was a very fair description of the most fashionable merino of to-day. In most cases these sheep were stall-fed, or. at worst, put in paddocks where they never had to forage,

and the result was that when they were put out into runs and fields where they had to do for themselves they were totally unfit. When it was pointed out that in the grease the wool from many of the high-bred merinos weighed from 25lb. to 30lb., it was quite feasible to think that the sheep should have size and strength to carry and support that load which was growing on him every day. In order to be the most profitable, therefore, the merino should be large and strong, with a good constitution. That large frame should be covered with an even fleece of big, bulky, strong, dense wool, corresponding with the sheep that bore it. While the wool should be bulky, dense, and long, it should be as bright, soft, and attractive-looking as possible, and of good character in wool. By "character" in wool was meant the crimps or curls. These should be as frequent as possible, well and evenly defined, and evenly distributed from root to tip of the wool fibre. The importance of character in wool could not be over-estimated, as it was the means of keeping the wool from "going-off." It was an indication of strength and elasticity, and gave the wool a better spinning quality. The typical wool for the Australian colonies, and the wool for which they were noted, could be described as a "big, bold, bulky wool, with good character and plenty of length." Density, of course, was essential, but it should not displace length of staple too far.

MANAGEMENT OF SHEEP.

Having decided on which was the best and most profitable breed or class of sheep for the conditions, the success of the undertaking would largely and almost wholly depend on the care and management bestowed on the flock. Not that a sheep required to be pampered, but it was essential that they should have regular care and attention, and that the person in charge understood his work. Over-stocking was one of the most frequent mistakes made by sheep-breeders. More sheep were kept than could be kept well, and the result was weedy, half-starved stock at the best, and often a large percentage of fatalities caused from starvation—ewes being unable to suckle their lambs, and diseases following such treatment. In the colonies, of course, sheep did not require housing, but they required shelter either in the form of a belt of scrub or timber or else an old straw or chaff stack in the case of a farmer whose country was all cleared. A sheltered paddock of good feed should always be reserved for ewes during lambing season, during which time the flock should have frequent attention, but left as undisturbed as possible. The water supply should be ample and good. Nothing was more harmful to the quality of the wool than to keep sheep away from water until they were almost famished and then let them have too much of it. Want of water or bad water would make a break in the wool more quickly almost than anything excepting fever or disease. It was a good plan to have troughs of salt and sulphate of iron placed about the fields. Any sheep suffering from any disease in the flock should have prompt attention, as sheep always herded together very closely, and anything infectious soon spread.

THE CHIEF DISEASES

that they were subject to in the colonies were lice, tick, flies, scab, footrot, and fluke. For lice, tick, flies, and scab the sheep should be dipped annually, whether affected or not, as it was not only a good preventative but the improvement in the fleece more than paid for the expense of the undertaking. Artificial dips were concocted usually containing arsenic, potash, pearlash, and sulphur in different quantities; but there were several recognised good dips placed on the market, and any of the well-known brands were good and cheap. Footrot was a disease very common among sheep on rich, heavy, damp country. The long-wool breeds of sheep were the least susceptible to this disease, the Romney Marsh being particularly good in this respect. To treat footrot, the foot should be carefully trimmed of any long growths of the hoof, the disease should be cleaned and exposed by the knife as much as possible, and the flock should then be run through a trough containing a good two per cent. solution of bluestone, copper sulphate. This treatment to the flock once or twice a week whenever the disease appeared was effective. The flock should also be given a different run on drier country if possible. Fluke was a worm-like parasite that occupied the bile ducts of the sheep's liver. Any treatment to a sheep that had already contracted this disease was almost useless, and preventive measures were best. The disease was confined almost solely to wet, marshy country where large numbers of snail abounded. These snail were a host to the parasite during the larval stage of their development, so that if one could exterminate the snail, the fluke was unable to complete its cycle of forms necessary to reproduce itself. The disease was known to be worse where the country was wet and marshy. Therefore by draining and by treating with quicklime the snail might be killed, and the disease thus eradicated. Burning the pasture during the summer is effective in lessening the disease. Any animal known to have contracted the disease should be at once isolated and killed, as the affected sheep was continually voiding fluke eggs, which hatched and found their way to the snail. From the snail the larvæ attached itself to the grass which was consumed by the sheep, and so the cycle continued. Flukey sheep should never be taken on to sound country.

BREEDING, DRAFTING, AND CULLING.

Whatever breed of sheep or cross-breed of sheep the farmer or squatter was going in for, he should first institute a regular system in his work of breeding, having his ideal firmly fixed; and in culling, drafting, and mating his ideas should be to obtain as near his ideal as possible. It did not do to breed for a few years to one type and then change to another—going back to the former one after other attempts—or the results were bound to be a failure. The ram is half the flock from a breeding point of view; therefore he should be good. The ram should always be of a pure breed, whether for cross-breeding or for breeding pure stock. He should be pure, and, although not necessarily a show animal, should have a good pedigree

and be true to type, with a good robust constitution. If for breeding fat lambs or mutton, his carcase-producing qualities should be most looked to, and if for wool, the wool-production points should receive attention, as well as the carcase and constitution. The flock should always be culled every year—taking out any that were over age or showed defects in the carcase or wool. Young ewes that were added to the breeding flock should be culled as heavily as possible, as there was always a worst. These should be marketed as fats if possible, and the best every year should be added to the breeding flocks. Referring to the age at which to breed young ewes, it should not be done until they were fairly matured. The period of gestation in the ewe was 21 weeks, roughly, five months. The ewes, then, should not be bred until fully 18 months old. They would then bear the lambs at two years, which was quite soon enough, and for show sheep breeding might be deferred for another year. As a rule, about three lambs might be taken from a ewe, but any exceptionally good ewes should be bred as long as they were able to rear a lamb.

Sheep were undoubtedly one of the most profitable and least expensive of domesticated stock. There were huge tracts of country devoted entirely to sheep in the colonies, and on most farms of any standing they were kept. Sheep should be kept on all farms, as, apart from their direct profits, they saved butchers' bills, they manured the land, and on cultivated and fallowed land they saved a vast amount of work by eating weeds and firming the soil. It was found in a great many parts of the colonies that almost as many sheep may be kept on a farm that cropped about one-third of its acreage annually as could be kept on land not cropped or worked; this is apart from growing summer and fodder crops. The reason for this was that the cultivation and manuring that the land got increased its stock-carrying capacity. Artificial manuring had done a lot for farmers in South Australia in regard to the number of sheep that they carried, and the quality of the feed seemed also to have improved. In fact, he (the lecturer) knew of several farmers who had manured their pasture land with artifical manures with good results.

Of the methods adopted by the sheep breeder there were several, according to conditions under which he is working.

For instance: Where one is situated far back from populated centres and means of marketing the sheep as mutton to the best advantage, and where the holdings are large and conditions in the way of feed and rainfall precarious, wool almost solely will be the source of revenue. Then as the country gets better and nearer the markets mutton production will take a more important position. Then again, in the populated centres where the holdings are smaller and mixed farming is carried on, the industry will become more confined and condensed.

The most applicable method to adopt for these conditions is undoubtedly lamb-breeding, and selling everything, except what is

required to keep the numbers of the breeding flock up, as fat lambs. The arguments in favour of fat lamb rearing are certainly very strong in the Australian colonies. In the first place, they are the means of getting an exceptionally quick return. With proper treatment, a flock of lambs ought to be produced to average nearly 40lb., dressed, at six months old; while practice has found out that in order to increase the dressed weight another 20lb. the wether will need to be fed and attended fully another 24 months.

Of course, to counterbalance this must be considered the two fleeces that are obtained during the 24 months. But this in no way makes up for the fact that every wether kept is displacing a ewe that would not only bear a fleece within a little of the same value as that of the wether, but would also give you a lamb each season into the bargain. On the same hand, again, a farmer's conditions are such that in the spring of the year he has got over an abundance of feed, but it is almost all of a succulent, perishable nature, drying up and blowing away in the hot dry summers that we have to contend with. Lamb-breeding, then, just suits these conditions. The lambs are dropped in the early spring of the year just as the new green feed is coming on well; they are kept until October or November, as the case may be, and then sold off, thereby practically reducing the number of the flock by half for the ensuing summer and early winter.

There is no doubt that in the near future this industry will do much for the farmers of Western Australia, and not only will the import trade of mutton and meat be stopped, but as the country becomes cleared and developed there is no reason why Western Australia cannot create a large export trade in this direction.

COWS HOLDING BACK THEIR MILK.

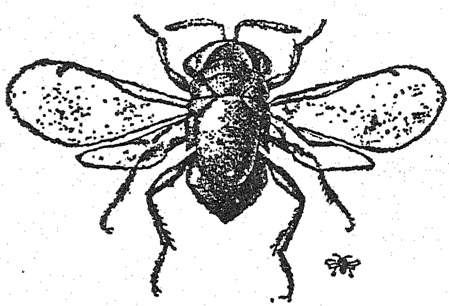
A correspondent writes asking "If there is any way or means of making a cow give her milk down. The calf was taken away at its birth and hand-reared. The cow's udder is full, but so soon as she feels the bail she holds her milk up." The matter being referred to the veterinary surgeon, Mr. Weir replies:—"That highly sensitive cows are particularly subject to this condition, and to assist in remedying the defect the animal should be very gently handled at the time of milking. Artificial feeding at this period frequently assists in this direction. The teats should be gently acted upon until the milk commences to flow, then the usual mode of milking can be gradually adopted. Sometimes gentle rubbing of the udder, before milking is commenced, will have the desired effect."

BLACK SCALE PARASITES

(*Scutellista cyanea*).

By GEO. COMPERE.

The steamer "Kyarra," which arrived at Fremantle on 20th July, from the Eastern States, brought (consigned by the State Commissioner of Horticulture of California to the Department of Agriculture) a small box, four feet long, six inches deep, and eight wide, in which was planted a living oleander tree. This tree is infested with black scale (*Lecanium oleæ*), and the scale in turn are infested with the larvæ and pupa of *Sutellista cyanea*, the most efficient parasite of the black scale yet discovered. For more than two years the department have endeavoured to get this valuable little insect introduced into this State. Twice it has been received from South Africa, and once from Ceylon, but in every case perished before they could be liberated. In the meantime several other species of parasites which destroy this scale had been introduced and become established in the State, and have done splendid work in reducing the scale in orchards where they have been liberated.



Scutellista cyanea.

From the published accounts which had reached the department concerning the work of *Scutellista* in freeing the orchard of California of the black scale, the Acting Director, Mr. Crawford, impressed upon me before leaving on my recent mission to Brazil, the importance it would be to the fruit growers of this State to have this insect established here, and instructed me to spare no pains in securing and sending from California a good live colony of *Scutellista*. Thus, with the kind assistance of Mr. Alexander Craw, Deputy State Commissioner of California, we have succeeded in bringing into the State an insect which will for ever put a stop to spraying or fumigation here for black scale.

The illustrations show on Fig. I. the box as received with the plant enclosed, and, Fig. II., branch of olive tree showing black scale *Lecanium oleæ*.

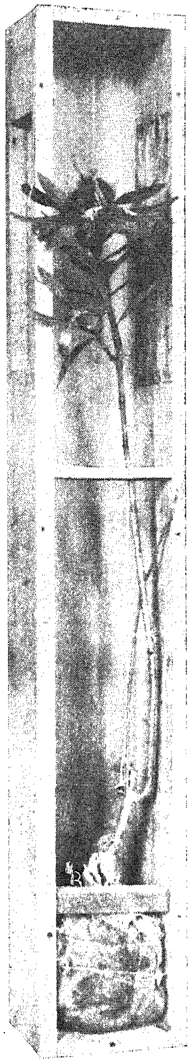


Fig. I.—Showing Oleander Tree infested with heavily parasitised Black Scale with the South African parasite (*Scutellista cyanea*) as received from California.

POULTRY NOTES.

By FRANK H. ROBERTSON.

A LARGE DUCK AND POULTRY FARM.

This State affords a splendid market for the raising of ducks for the table, and it is surprising that so little attention has been paid to this profitable by-product by the all-round farmer. During my travels over all parts of the agricultural portions of this State I cannot call to mind any person who raises ducks to any extent; and it certainly seems paradoxical that the first person to go in for duck-raising on a large scale should be situated at Kalgoorlie; yet such is a fact, and during my recent visit to the Goldfields I had the pleasure of inspecting the Carisbrook Duck Ranch and Poultry Farm, owned by Messrs. Fuller, Naughton, & Co., situated at Sommerville, about two miles from the Kalgoorlie Post Office. I first saw this farm three years ago, when only a few pens of pure-bred poultry were kept. The following year a start was made in the formation of the Duck Plant, and this year I find it in good going order and had an output of 3,300 ducks during the past year; but the coming season Mr. Fuller (the member of the firm who attends to this part of the business) tells me he proposes to raise between eight and ten thousand head, as the incubator capacity has been increased to about 6,000 eggs: it consists of 14 machines, each holding 360 eggs, and six, each to hold 120 eggs. The small machines act as feeders to the large ones, as two large machines and a small one are all filled at the same time. All eggs are tested at three days, by means of a powerful egg tester. All clear are taken out, and at such an early testing are quite good, and with yolks unbroken. The eggs from the small machine are then used to replace the clear eggs taken out of the large ones. By this means a saving is effected, as the machines are thus kept at their full capacity. All the incubators are from the Cyphers Co., America. They are on the hot-air principle, and the temperature is automatically regulated by a metallic thermostat composed of two aluminium bars fixed to duplicate rigid metal rods. The aluminium is sensitive to heat, and thus raises or lowers the rod as in the tank machines. Mr. Fuller speaks very highly of the Cyphers Incubators, as they keep a very even temperature, and do not require any alteration of adjustment. Any changes are done by raising or lowering the flame of the lamp, the temperature is run as near as possible at 102½ degrees for the first week, gradually increasing it to 104½ degrees during the last week. The damper is always run about ⅛ of an inch off the heater. The eggs are never damped, but in hot weather the sawdust on the floor is sprinkled with water to keep the temperature moist. The eggs are aired and

turned twice a day; no marks are made on them, but as the drawers are on the slant, it is an easy matter to change the position of the eggs by first taking some from the lower part, and rolling the remainder down. The egg drawer of these machines has a glass front, through which the thermometer is easily visible, and during the time the eggs commence to chip the drawer is never opened until the hatch is completed. The actual hatching process is clearly visible, and it is interesting to watch the struggles of the little ducklings from the time their beaks appear through the shell until they approach the front of the glass door, to which they are attracted by the light; but just as they reach the glass, there is a small opening, through which they tumble down a few inches to the drying chamber, where the temperature is three or four degrees lower. There they remain quite snug until the hatch is completed, when they are removed to the warm brooders.

The Incubator house is a neat and commodious structure, 32 feet in length by 16 feet wide, built almost entirely underground, the wall plates are two feet above the outside ground level, the roof is of iron, covered to a depth of 12 inches with earth, the interior lining of the walls is jarrah, painted an attractive green colour, the earth floor is thickly bedded with sawdust. Great attention is paid to ventilation, currents of air are driven into the room by means of two air funnels as on board ship, there is also a large ventilator in the centre of the roof, the door and side windows are also frequently left wide open, so that a circulation of pure fresh air is constantly passing through the room, the temperature is very even, never getting too cold, and in summer, with an outside temperature of 100 degrees in the shade, the room registers about 80, thus serving as a pleasant cool retreat in the hot weather.

Ducklings in lots of 100 pass the first week of their existence in Cyphers, Out-door Brooders, which are artificially heated by a lamp placed underneath the raised chicken floor, the heat goes through a funnel, and indirectly to a Radiator, but no direct fumes from the lamp enter the chicken chamber. The first thing given the young ducklings is finely crushed oyster shell, then for two days hard boiled eggs mixed with finely crushed toasted bread, then bran, pollard, and oil cake. On the eighth day the ducklings are removed in lots of 40, and for four weeks are kept in the brood house, a large structure divided into a number of small divisions by means of wire netting a foot high, thence they are moved to the fattening pens where they are kept in lots of 30 each, and sold at under 11 weeks old, weighing dressed, about 3½ lbs., and fetch 14s. per pair at Christmas time, the average price being 11s. for all the year round.

The total area of the farm is eight acres, and is all fenced with six-feet wire-netting, topped with barbed-wire; there is also another barbed-wire about six inches from the ground, to keep dogs and goats from breaking in. The soil is the well-known goldfields red sandy loam and gravel, on which there is a good supply of scrubby undergrowth; the whole property having a gradual slope to the East.

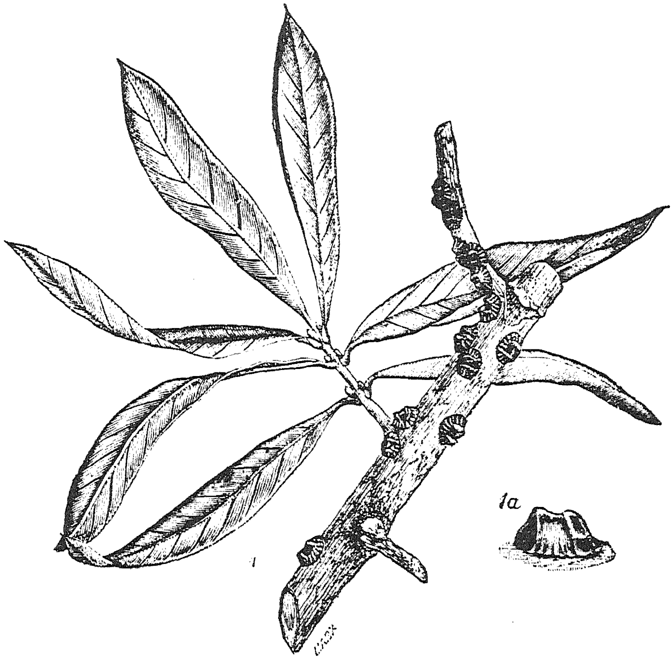


FIG. II.—BLACK SCALE.

Lecanium oleæ.

FIG. 1—Olive branch infested with Black Scale.
FIG. 1*a*.—Full grown Black Scale.

The stock ducks are, to a great extent, of Pekin blood, but not pure specimens; with them are mated drakes chiefly of Rouen type, as it is found they are active and give a better fertility than heavy pure birds. At present (July) three ducks are run to one drake, to be increased to four ducks as the weather gets warmer.

The stock ducks, now numbering 480, are kept in flocks of 55 in triangular runs of about a quarter of an acre each; no houses are provided for them, but in summer time ample bough shade is erected. Water is laid all over the farm from the Coolgardie Water Supply, and raised duck ponds are built on the dividing fences, thus each one serving for two runs; the water is emptied twice a week by withdrawing a plug, and then refilled with fresh water. The feed consists of hotel scraps, slaughteryard offal, cheap potatoes, cabbages, etc., also bran and pollard; all feed is boiled in three large coppers, which are kept going night and day, necessitating, during the busy season, a man carting wood continually, as a load of wood is burnt daily. For stock ducks a liberal supply of meat and vegetables are added to the food, to which is added a liberal supply of coarse sand. The food is taken round the runs in a wheelbarrow, and served hot, in latticed frames standing on sheets of iron, the ducks by this arrangement do not walk over the food, and therefore keep much cleaner than if fed from heaps. Mrs. Fuller personally superintends the feeding as she considers it very important that the correct quantities should be served. The system of feeding is evidently a good one, as last season's egg production was very satisfactory, when from 140 breeding ducks for the four months, from August to November, the egg production averaged 125 eggs per day, very steady at that, and did not vary more than three or four eggs a day.

For the fattening ducks a different ration is used, viz., boiled wheat, dried off with pollard, to which is added a small quantity of meat and a liberal supply of greenstuff. These ducks do not have access to the ponds, and have a limited supply of drinking water, with plenty of grit. Mr. Fuller considers that ducks have no diseases, at least his have none, and his birds are never troubled with leg weakness, which so many persons complain about in various parts of the State.

In addition to the duck-raising, the following breeds of pure poultry are kept, viz., Brown Leghorns, Buff Orpingtons, Silver Wyandottes, and Minorcas, and last year, in addition to the 3,300 ducks, 800 pure fowls were reared. At the present time there are 400 strong, healthy-looking chickens in the brooders scattered in various parts of the farm. There is also a special breeding pen of good, pure, typical Pekin ducks.

That this farm will ultimately prove a very successful and lucrative undertaking there appears to be little doubt. Mr. Fuller has thoroughly satisfied himself that there is no shadow of doubt about it, and for a comparative novice to have brought the farm to its present condition speaks well for the enterprise and thought necessary to carry it out; but to Mrs. Fuller, on whose hands falls

the responsibility of constant supervision and personal attendance, all credit is due. From early morn till late at night she is kept going in attending to incubators, foster mothers, and the feeding of ducklings and chickens. She is also assisted by a lady companion, and for the heavy work three men are employed, viz., one to attend to the coppers and feeding; one rough carpenter kept going all the time; one cleaning out houses and runs; and in the season an extra man is required to do nothing but cleaning out runs, etc. The work is great and constant, as young ducklings are fed five times a day, stock ducks twice a day, and those in the fattening pens three times. All runs, when empty, are turned over and sown for greenstuff, the fattening yards are cleaned out twice a week, and dug over every fortnight. This, of course, means a tremendous amount of work, but it is necessary, as Mr. Fuller says cleanliness is the secret of success.

The outlay of capital has been great, the total expenditure on plant now amounts to between £1,400 and £1,500, and the expense of labour is considerable. On the other hand the food bill is comparatively moderate, as already explained, the cartage on which is light, owing to the close proximity of the farm to the town, and the cost of railage of wheat, bran, pollard, etc., is not so expensive as one would think, being 27s. 6d. a ton above Perth prices. Messrs. Fuller, Naughton, & Co. are, however, in an exceptionally good position to obtain the best possible price for the products of their farm, as they are sold at their retail butcher's shop in Hannans Street. The firm carries on a large wholesale and retail butchering business, and are thus brought into direct contact with the best and largest consumers of poultry products. A very big saving is thus made which is not enjoyed by the ordinary farmer, who has first to pay railage to the Perth or Goldfields' markets, where it is bought by dealers or poultrymen before it reaches the consumer's table, but at this Kalgoorlie farm the three heavy items of railage, auctioneer's charges, and the dealer's profit are all saved. Then, again, the retail prices realised are much above those obtained at Perth, so that taking all things into consideration the prospects of the Carisbrook duck and poultry farm turning out a very profitable venture appear most favourable. Its future will be watched with much interest by the writer, who hopes to be able to pay it a fourth annual visit twelve months hence, by which time no doubt the plant will be working to its fullest capacity. On such occurring Mr. Fuller talks of invading the Perth market with his prime fat young ducks. The advent of the water supply to the Goldfields, combined with a greatly increased rainfall, has quite altered the conditions in these hitherto arid regions. Mr. Fuller has good-sized patches of rape and lucerne nicely showing above the ground, and everywhere are to be seen pretty gardens, where flowers and shrubs are doing splendidly; violets I saw in full bloom at Coolgardie, and vegetables of all kinds thrive well. Grapes, I am also told, can be satisfactorily grown and ripened. Many persons are planting fruit-trees, and there are several market gardens.

WEST AUSTRALIAN BEEKEEPERS' ASSOCIATION.

Annual General Meeting and Conference held in the Temperance Hall, Perth, 27th and 28th July.

WEDNESDAY, 27TH.

The annual meeting of the W.A. Beekeepers' Association was held in Perth, followed by the yearly conference. The president (Mr. J. N. Shipton) occupied the chair. There was a large attendance.

The Minister for Lands, in opening the conference, said that the large attendance, compared with the modest one of last year, augured well for the future of the association and the success of the industry. That the latter was a profitable side-line for settlers, big and small, was generally admitted. Recently the Director of Agriculture had reported that in twelve months no less than 600lbs. of honey had been taken from one hive in the Guildford district. The market before the industry was practically unlimited, for up to date something like £17,000 of honey had been imported into the State. The gratifying feature about the question of importation was that it was rapidly decreasing. Whilst he was Minister for Lands the beekeepers of the State would have a friend and the industry a supporter.

The President, in his annual report, said the association had made good progress during the year. The question of the propagation of special honey-bearing trees upon Government reserves, parks, and streets the Forestry Department had promised to assist as much as possible by planting those which were nectar-producing. A sum of £5 had been appropriated from funds towards importing queen bees, and several had arrived, and had been distributed amongst the members, on the understanding that they should return in the early spring at least two queens, the progeny of the imported stock. Reports from the country district associations were read, and showed that although the season had been a bad one, beekeepers were hopeful for a good harvest this coming season. The Agricultural Department had been requested to appoint an expert to the vacancy caused by Mr. Sutton's retirement from that position. The thanks of the association were due the Secretary for his efforts in advancing the interests of the association, and also to the committee for their services.

The Secretary read the financial report for the past year, which showed a credit balance of £5 15s. 6d. The Secretary explained that out of this balance had to be taken the expenses of the conference, which would considerably reduce the balance in hand. On the motion of Mr. Hilton, seconded by Mr. Layton, the financial statement was adopted. Consideration was given to the alterations to the rules, which were prepared by a sub-committee appointed for the purpose; these will be printed and forwarded to members in due course.

On the motion of Mr. Carruthers, seconded by Mr. Clifton, it was decided in the interests of the association, considering the work which was being carried out, to raise the membership fee to 5s. per annum. A suggestion was put forward that next year's conference be held at the headquarters of one of the country associations, but on the motion of Mr. Ankers, seconded by Mr. Sutton, it was decided to allow the committee to make arrangements when the time arrived.

The election of officers resulted as follows:—President, Mr. Shipton (re-elected); Vice-Presidents, Messrs. Sutton, Dickie, and Kline; Patron, Capt. Oats, M.L.C.; Secretary and Treasurer, Mr. Potter (re-elected); Committee, Messrs. Ankers, Anderson, Hilton, Street, Masterson, Ainslie, and Mrs. Hilton.

Mr. J. B. Kline read an interesting paper on "Bees and Bee-keeping." He said that with conditions so much in favour of the apiarist the industry should have a bright future before it in this State. The advantages of apiculture in relation to agriculture were generally recognised, and although there were still some farmers who contended that an apiary on the farm was a nuisance, this objection was being overcome by the dissatisfied ones procuring hives and thus retaining for themselves the article which hitherto had been gathered on their property by other people's bees. The flight of bees was seldom farther than the nearest pasturage—the farther it was necessary to travel, the less the bees could carry. It therefore behoved the association to take steps to prevent, as far as possible, indiscriminate destruction of trees. In this State the natural source from which honey was gathered was the gum tree, and in the absence of these, in cities, bees did not thrive so well. Some purveyors made a feature of the fact that their honey came from gardens, and labelled it "pure garden honey," yet one good gum tree in bloom was worth an acre of flower beds. The best honey came from districts where there was one kind of tree, for flavour and aroma reach a high standard of excellence. Mr. Kline then dealt with the quality of Western Australian honey, and pointed out how this could be improved. The local honey needed more maturing, and more careful handling, to make it sufficiently good to compete with the imported article. The four essential points of good honey were flavour, aroma, density, and clearness; and for the open market the honey should be examined by an expert and graded. At present good and inferior honeys were dumped together, and the prices consequently were based on the

lowest instead of the highest grade. He did not infer that adulteration was necessary, but only that more care should be taken in preparation for market. He was favourable to judging produce at show by points.

Mr. Kline was thanked for his paper, and an interesting discussion followed.

THURSDAY, 28TH.

The schedule of prizes for the Royal Agricultural Society's Show to be held in Guildford received consideration in the apicultural section, and several small alterations were suggested, which have been placed before the Secretary of the R.A.S. It was also suggested that the Secretary ask R.A.S. to have a wire or other screen placed around exhibits after the judging has been completed, to prevent pilfering. Mr. Sutton suggested that the association adopt some badge of recognition to be worn by members of association.

On the motion of Mr. Rees, the Secretary was asked to call tenders for the supply of honey tins for coming year; quantity, 100 gross, more or less.

Captain Oats, M.L.C., and Messrs. Shipton and Potter were appointed a deputation to wait on the Hon. the Minister for Lands and place before him the following motions:—

1. That the Department of Agriculture be asked to reinstate the position of bee expert.

2. *Timber Destruction.*—That the Lands Department take such action as shall be necessary to prevent the wholesale and indiscriminate destruction of trees on Crown lands, pastoral leases, commons, etc., and, if necessary, to amend the present Act so that honey-producing timbers which are only useful as firewood, etc., may be allowed to reach maturity, and to enforce such clauses in the Act that are at present favourable to the bee-keeping industry.

3. *Forest Licenses.*—In the event of the Government granting licenses on Crown lands for the purposes of apiculture, a clause should be inserted preventing beekeepers settling within three miles from an already established apiary of more than 20 hives.

4. That the Hon. the Minister be asked to make a grant of money to the association for the general advancement of the interest of the industry. By the dissemination of suitable literature, importation of queens, and such other methods as may from time to time appear useful.

The following question was discussed, and, on being put to the vote, was lost:—

That the Department of Agriculture establish experimental apiaries under the supervision of the expert for purposes of queen

raising; also in connection with same to import a variety of select breeding queens.

In answer to a question, the Secretary detailed facts obtained by him in relation to the publishing of a Bee journal, and, after considerable discussion, the time was considered inopportune for the association to launch out on such a venture.

Votes of thanks were passed as follows:—

(1.) To those municipal councils and local governing bodies that had during the year planted honey-producing trees on their streets, parks, reserves, etc.

(2.) To the Department of Agriculture for assistance rendered to association during the year.

(3.) To Mr. Shipton for the able manner in which he carried out the duties of chairman during the conference.

The conference was concluded at 6 p.m. on Thursday, 28th, and in the evening a Lecture on Bee-keeping was delivered by Mr. Sutton.

JUDGES FOR AGRICULTURAL SHOWS.

As considerable trouble has existed in the past in obtaining the services of good men to act as judges at shows, Mr. Crawford, the Acting Director of Agriculture, invited the co-operation of agricultural societies to assist in compiling a list of those who would act. The invitation, however, was not readily responded to, only a few of the societies replying, but as a result of the hearty co-operation of the secretary of the Royal Society, Mr. Theo. R. Lowe, we are able to publish a list of gentlemen who are capable of acting, for the use of those societies who may be in want of the services of any particular judge.

FAT STOCK.—Messrs. Isaac Woods, Guildford; Ed. Roberts, Yatheroo, Dandaragan; J. J. Holmes (Holmes Bros.), Fremantle; G. W. Stubbs, Leederville.

DAIRY CATTLE.—Messrs. A. Crawford, Department of Agriculture; R. E. Weir, Department of Agriculture; E. W. Loton, Belvoir, Swan; H. Climie, Cranbrook.

DRAUGHT HORSES.—Messrs. J. W. Taylor, Pingelly; T. W. Hardwick, Perth; J. C. Scott, Intercolonial Horse Bazaar, Pier Street, Perth; T. H. Wilding, Mokine.

BLOOD HORSES.—Messrs. E. F. Darlot, Perth; W. Macpherson, Perth; W. Strickland, Perth; J. M. Craig, Chidlow's Well; W. B. Mitchell, jun., Dongara.

HORSES IN ACTION—Messrs. S. Grimwood, Perth; G. F. Darlot, Perth; Jas. R. McKenzie, Esplanade, Perth; J. H. Ogborne, St. George's Terrace, Perth.

MERINO SHEEP.—Messrs. F. R. Walsh, Northam; G. G. Holmes, c/o Connor & Doherty, Fremantle; A. Edgar, Gingin; W. McKenzie Grant, Newmarracarra, Geraldton; A. R. Richardson, Serpentine; C. K. Davison, Glentromie, New Norcia.

COARSE.—Messrs. W. B. McDonald, York; J. P. O. Wellard, Benger; H. Climie, Cranbrook.

WOOL.—Messrs. G. G. Holmes, c/o Connor & Doherty, Fremantle; F. Faulkner, Department of Agriculture.

PIGS.—Messrs. J. Morrison, Guildford; J. P. O. Wellard, Benger; G. M. Richardson, Woorooloo; — Rewell, Northam; J. M. Ferres, Attfield Street, Fremantle; G. W. Stubbs, Leederville; W. Watson, Fremantle.

BEES.—Messrs. J. Shipton, Barker Road, Subiaco; C. Cooke, Woorooloo; J. M. Sutton, Wingate, South-Western Railway; C. Smith, Baker's Hill.

FARM PRODUCE.—Messrs. P. G. Wicken, Narrogin; D. Milne, Perth; Jas. Nicol, Perth; R. G. Burges, York.

DAIRY PRODUCE.—Messrs. W. Watson, Fremantle; A. Gorrie, Fremantle; Theo. R. Lowe, Perth.

FLOUR.—Mr. A. Gorrie, Fremantle.

FRUIT.—Messrs. Price, Illawarra Orchard; A. Despeissis, Department of Agriculture; E. M. Clarke, Bunbury; Theo. R. Lowe, Perth; J. P. Breen (Tolly & Co.), Fremantle.

WINE.—Messrs. F. F. Cross, United Stores, Perth; A. Despeissis, Agricultural Department.

CULTIVATION OF SALT BUSH.

The following interesting report on the experimental cultivation of salt bush has been received from Mr. J. W. Logue, of Myarree, who says :—" I beg to report on growth of salt bush seed obtained from your department last year.

" When I received the parcel of seed, I divided it into two lots, and planted one lot on a piece of land I could irrigate, and the other lot I planted on a salt flat, were samphire grew. I grubbed out the samphire and put the salt bush seed in where the samphire was grubbed out. The seed came up well on both patches, but when the plants got to about three inches high, I am sorry to say that the kangaroos got at them and pulled most of the plants up, and bit others off close to the ground and they then died out. The few plants that they left I covered with bushes, and they have now grown into nice bushes from 18in. to 2ft. high. The kangaroos come in in the night time, and it is almost impossible to fence against them.

" With regard to the patch that I could irrigate, the plants on it have done better than those that did not get any water in the summer.

" I think the saltbush will be the best thing to grow for green fodder. Up in this dry district I have tried the paspalum grass. That was supposed to be a good grass to grow in hot dry districts, but it is no good here unless it can be given water, and the water must be fresh.

" But with the saltbush brackish water will do to irrigate with. Water that would be too saline to give to any other vegetable will not harm saltbush. I tried watering some of the plants with brackish water and some with fresh water, and as far as I can see the plants watered with brackish water have done the best.

" So that anyone having a good supply of brackish water could grow saltbush for green fodder.

" I am going to try growing the saltbush from cuttings from the plant I have growing. I believe it can be grown from cuttings."

FARM NOTES.

By FRANK L. FAULKNER

The past month having been one of an exceptionally wet character, little or no farm work with the teams has been possible in almost all the agricultural districts. However, as soon as ever the land will bear them, all horse-power should be got going again in order to have as much land as possible ready for the drill next season, before the weather becomes too wet.

During the weather that is too wet to work outside, the farmer should never be idle. He should seize the opportunity of cleaning and doing up his implements. Cleaning, oiling, and putting a timely stitch in his harness. Darning, patching, and putting away from the reach of mice all cornsacks which, if not good enough for marketing wheat in, can be utilised for storing seed and seconds in.

Referring to the implements. All implements should be housed, cleaned, and examined as soon as possible after their season of use is finished, and while any defects, such as cracked or worn castings, are still fresh on the memory. These should all be renovated or renewed, and the whole machine, after having the bearings and corners freed from clogged dirt and grease, should be wiped over with oil. The woodwork and the iron of the framework repay the cost of an occasional coat of paint in additional length of service.

As the weather becomes fine, but while the land is still too wet to carry the teams, any amount of work may be found in the way of putting up shelter sheds for the stock or implements, for which—if a farmer is a good manager—he will have the material ready for putting together. On the other hand, if the farm is an older established and improved one, there is invariably plenty of work to be done in the way of renovating—looking to spoutings that drip, broken railings and loose wires in the fences and an endless number of such jobs that can be done just as well at these times, and if well attended to will make a vast difference to the efficiency of the more important work when it is possible to go ahead with it.

In the later districts summer crops such as sorghums, and in the lower, moister ground maize, mangolds, and kale should shortly be started on land that should be already ploughed up. In the later districts they can be planted well on into the summer, but where the rainfall is lighter and the land higher and drier, summer crops should be already under way. Lucerne should be planted on land that has been well prepared as soon as it becomes dry enough

to work. Paspalum roots should also be planted out before the dry weather sets in altogether.

In sowing the paspalum seed, I think it would be wise to try it on well-prepared land, drilled in with a little perennial rye grass or some such crop that will protect the young plant from the effects of the hot sun during the summer. It is well known that the paspalum in its young stage is very delicate, being very easily scorched and killed by the sun. The plan generally adopted is to rear it in choice spots, well sheltered, transplanting the roots the second year. This system, however, is slow and laborious where large areas are to be planted, and the system of mixing mentioned above will, I believe, largely overcome the difficulty and expense.

The cultivation, too, will have a very marked effect on the way the crop will stand the summer months, and I am sure that if more attention was turned to the cultivation, the results obtained from sowing the seed straight into the field would be much more satisfactory.

Stock on the farm should all be in fair condition now, and if not fat should be picking up rapidly. Ewes and lambs should be kept on good feed, so as to keep the lambs growing. Mares in foal should be handled carefully, care being taken not to strain them in any way. On the other hand, it is advisable to keep them at light, slow work, or they tend to become too fat. Pigs will do well in their grass run without very much grain feeding, and breeding so arranged to have the litters in a month or two should give good results. The most important work on the farm just now is the fallowing, which should be pushed on with as soon as ever the land is dry enough to hold the teams.

THE GROUND NUT.

The Ground Nut, also known as the Earth Nut or Pea Nut, is the subject of an article full of interesting points in the *Queensland Agricultural Journal* for May last. We have ourselves written a great deal already on the subject of ground nuts, in addition to importing, growing, and distributing seeds of the best varieties; but one cannot say too much about a good thing, and it is only by reiterating what we want our readers to know of the value of this useful plant that we hope to impress cultivators with the possible advantages of growing it.

The general idea is that the ground nut is an element of what constitutes school-boy "trash," that it is difficult of digestion, and, therefore, hardly a suitable food for human beings. It is not known to most people that the nut plays any more important rôle in the world's economy than that of a comestible favoured by indiscreet juveniles.

As a growing plant many look upon it as a botanical wonder, in that it forms its fruit under ground (hence the specific name "hypogea"). Some people are under the impression that the flowers are borne under ground, and after fertilisation *sub terra* develop fruit. What really takes place is that the long-stalked ovary, after fertilisation, delves into the earth, where it buries itself and proceeds to grow and mature.

Those who know something about ground nuts believe that the plant is only to be found under cultivation in India, and are not aware that something like 40,000 tons per annum are produced in the United States only, the ton being worth from £16 to £19.

As regards its uses, we are told that immense quantities are utilised in confectionery, and still greater quantities crushed for the excellent oil, which is a substitute for olive oil. The nut itself is largely consumed as food, and the resulting cake, after the extraction of the oil, is one of the most nutritious cattle foods.

A fair average crop is said to be 2,000lbs. of nuts per acre, but one of 4,000lbs. is by no means uncommon, while in Senegal as much as 6,000lbs. has been produced by a single acre.

In planting, the seeds are set in drills about three inches deep, one foot apart in the rows and three feet between the rows. It takes about 16,000 seeds to plant an acre; the crop ripens in from four to six months.

As regards soil, the ground nut likes a good sandy loam. It is recommended that the soil be loosened and tilled to a depth only of four or five inches, and a firm bed provided beneath, on which the nuts when formed may rest. With deeper cultivation the fruits take longer to ripen, are more difficult to harvest, and are subject to many risks. When taken up the nuts should be properly dried before storing.

Last year over 180,000 tons of the nuts reached Marseilles from Bombay, Mozambique, and Senegal. The last-mentioned country produces enormous quantities. The nuts contain 30 to 50 per cent. oil.

RE-QUEEN YOUR HIVES. WHY? WHEN? HOW?

Like all other branches of industry, in the production of honey competition has been so keen that the bee-keeper is obliged to seek every means by which the profits can be made to compare more favourably with the cost.

As so much depends upon the queen, she must come for first consideration. Now, as the period of her usefulness is only two to five years, it is necessary to re-queen the hive occasionally. This the bees will attempt to do themselves, but for various reasons often fail, and the colony runs down. It is better then to make sure you have a good *tested* queen. Another reason. One may not have the breed of bees suited to his purpose, and wish to change by re-queening. He may have native blacks, and find them of little use; or brown Germans, and find that he has good comb builders, but too easy-going and good-natured to keep the hive supplied with food, or keep out the robbers, ants, and moths. Or he may have the so-called "Italians," who will gather honey quite well—defend it; but, owing to the methods of breeding these bees *for sale*, their lives may be short, and their energy consumed in rearing sufficient brood to keep the colony up. Or he may have some other fancy breed as Albinos or Holy Lands, and find he has only weaklings. Or he may have Egyptians, and find although they gather lots of honey and defend it—they are too cross for him. Even pure Cyprians or Corniolans might not suit him. But the breeds of bees that have been discovered and studied are so numerous, and their distinctive features so varied, that either by selection or judicious crossing almost anything desired can be obtained, if one lets his queen-breeder know exactly what he wants, rather than take just what the breeder wants to dispose of for cash regardless of what the consequences may be for the buyer. What is the best time to re-queen? Generally speaking, just before the honey flow begins. By putting in a young, vigorous queen we may stimulate brood rearing just when bees are of most value to us. At other times, if a colony is running down with a poor queen, it is generally better to destroy her and give her combs and bees to another colony that might be weak from other causes.

How to obtain queens? If one has the breed of bees *best* suited to his conditions and is well isolated, by getting fresh blood each year, he can rear his own queens, using his own drones. If there are ill-bred bees within five miles his efforts will be futile. He might better then buy his queens from some reliable breeder, who will supply him now-a-days at nearly cost price in quantities. But be sure to order what you want and see that you get it. See that he does not mate your queens to drones from the same stock—akin to them; nor

rear them by so-called scientific methods, invented by breeders to rear a large number of queens from a comparatively few colonies. Such queens will perhaps do well for a few months, but both them and their progeny are short lived, and will prove less useful perhaps than even the ordinary black bees.

Deal only with reliable breeders who would not lie or deceive for the price of their stock. Beware of those who can sell more than they can rear. Often the best animals are found among the small unpretentious breeders.—*Exchange.*

THE ARTIFICIAL HATCHING OF CHICKENS.

With the greatly increased attention given to the rearing of poultry which has marked the last decade, a modification of methods previously adopted has been strongly in evidence. Consumption of eggs and chickens and ducklings has grown enormously, both as to the numbers required to meet market demands and the periods of the year when produced. In no direction is this modification to be noted more than in the employment of artificial hatching and rearing, for it is not too much to say that the increase of supplies would have been practically impossible to the extent now seen had the natural system been entirely depended upon. Hence incubators and brooders are largely employed. The natural functions of our hens are supplemented by machines, which have been brought to a high state of perfection, although they may not have reached the final stage of their evolution.

The question is frequently asked whether artificial hatching is satisfactory. In the minds of practical poultry-keepers there is no doubt whatever. They recognise that it would be difficult to carry out their operations were hens only to be entirely depended upon for the work of hatching and rearing. Early chickens and ducklings, either for killing or as laying stock, would be fewer than is the case at present, even though the supply is still very deficient. But of actual data showing the results from incubators we have not much that enables farmers and others to realise the benefits of the system. During the 12 months ending 31st March, 1904, a careful series of observations have been made at the College Poultry Farm, Theale, where the practical instruction in poultry-keeping is given to students attending courses at the University College, Reading. The following notes embody these observations.

Where operations are upon a small scale, the recommendation has generally been made that an incubator should be placed where

variations of atmospheric temperature will be minimised as far as possible, and sweet, well-ventilated cellars are frequently used as hatching chambers. No place could be more suitable where only one or two machines are worked. These machines may be depended upon to maintain a fairly even temperature in the egg chamber, provided that the range of variation to which they are subjected is neither wide nor abrupt; but they have their limitations, and are unable automatically to provide for sudden rise or fall in atmosphere. For that reason a slightly-built structure, exposed to cold or heat, involves greater attention in working incubators placed in them on the part of the operator. With the increased use of incubators, and the need for a much larger egg capacity at one time, special buildings are required, and these are now to be met with to an extent not anticipated a few years ago. In America huge plants are to be found, where 30,000 to 40,000 birds are hatched annually, and there are in this country establishments which are not far behind. Across the Atlantic, however, the climatic influences are very different from those met with in the United Kingdom. To meet the extreme cold of winter and the great heat of summer in America it has been found desirable to place incubator houses partly underground, for the reason already given. But with the more equable climate of the British Islands, above-ground erections, provided they are well built, yield satisfactory results, and the expense of excavation is thus avoided. A reference to Table I. will show that the variations are by no means so great as might have been anticipated in what may reasonably be termed the hatching months of the year, although it must be remembered that the summer of 1903 was marked by the absence of high temperatures.

To meet the demand for increased accommodation and the requirements of students, the University College, Reading, erected upon the College Poultry Farm, in the early part of 1903, an incubator house designed by Mr. Edward Brown, F.L.S., the Lecturer in Aviculture. This house is 32 feet long by 16 feet wide. It has double walls of inch deals, between which felting is placed. The roof is of inch deals, covered with felting first, and finally with corrugated iron. It is lighted by four windows facing the east, so as to avoid the sun's rays passing into the room. The walls stand upon a double row of bricks, and the floor is laid with Staffordshire tiles. Inside the building is divided into two compartments; first, the outer porch, 5 feet by 16 feet, where stores are kept and lamps cleaned; and, second, the incubator room, 27 feet by 16 feet, connected by double folding-doors. As a dozen machines have to be accommodated in this room, the consumption of oxygen—both by the oil lamps heating the machines and the requirements of 1,200 eggs—must necessarily be considerable. Hence great attention was given to ventilation. Fresh air is drawn into the incubator room by eight four-inch pipes, shown in the drawing, the cowls of which are six feet above the ground outside, and the air enters the room below the level of the machines, so that as it ascends both lamps and eggs in the incubators receive a plentiful supply of absolutely

fresh air. Were the circulation downwards upon the machines, the air before reaching the eggs would necessarily be affected by the lamps. To this system of ventilation may be attributed much of the success recorded below. The house is placed in a sheltered position, under the shade of a large walnut tree, with a view to modification of summer heat.

TABLE I.—*Comparative Temperatures in the Open Air and in the Incubator Room.*

Date.		Outside.		Incubator Room.		
		Maximum Temp.	Minimum Temp.	Temp.	Morning Humidity of Atmosphere.*	Afternoon Temp.
1903.		°F.	°F.	°F.		°F.
March 12	...	51	27	58	66	59
,, 20	...	56	41	61	74	64
,, 28	...	60	39½	62	64	62
April 3	...	50	29	62	62	68
,, 4	...	55	47	62	73	67
,, 16	...	47	25½	59	56	61
,, 23	...	43	28	59	60	58
,, 30	...	60	46	63	66	68
May 8	...	62	35	64	62	64
,, 15	...	62	45	66	59	68
,, 19	...	63	32	66	64	69
,, 28	...	70	54	68	74	71
June 3	...	82	40	58	57	62
,, 13	...	57	39	69	68	61
,, 24	...	72	53	70	56	74
July 2	...	89	46	66	68	78
,, 14	...	65	42	66	64	69½
,, 25	...	77	43	66	72	69
Aug. 10	...	70	54	67	68	69
,, 25	...	56	52	62	72	66
1904.						
Jan. 13	...	51	44	50	94	40
,, 17	...	42	27	42	93	49
,, 23	...	42	23	42	89	49
,, 30	...	46	40	51	94	52
Feb. 6	...	48	35	55	80	54
,, 12	...	42	29	52	81	52
,, 13	...	49	39	54	70	56
,, 22	...	53	47	55	70	59
March 4	...	40	26	51	74	48
,, 10	...	57	38	49	69	52
,, 17	...	49	26	55	93	59
,, 24	...	48	36	50	94	54
,, 30	...	53	30	52	82	56

* In the room a wet and dry bulb thermometer is used, by which the temperature of the room is recorded, together with the saturation point; and the humidity is calculated by a Negretti and Zambra moisture meter.

It is interesting to note how far the extremes of outside temperature affect the atmosphere within the incubator room. The maximum and minimum outside temperature, the morning temperature and humidity of the atmosphere, and the afternoon temperature in the incubator room on a number of selected days from 12th March, 1903, to 30th March, 1904, are shown in Table I. On 16th April, 1903, when six and a-half degrees of frost were registered, the inside air did not fall below 59 Fahrenheit, and on 23rd January, 1904, when nine degrees of frost were registered, the inside temperature was 45 Fahrenheit. On the other hand, on the hottest day recorded, 2nd July, 1903, when a maximum temperature of 89 degrees is given, the inside temperature was not above 78 Fahrenheit. The variations of temperature in the room were as follows:—

Month.	Highest Temperature.	Lowest Temperature.
1903.	°F.	°F.
April	69	57
May	76	62
June	82	57
July	82	60
August	73	60
1904.		
January	54	41½
February	59	47
March	65	46

For these observations four classes of machine were used, namely, A, Hearson's Champion; B, Tamlin's Nonpareil; C, the Cypher's; and D, the Clive. A, B, and C, are well known representing two types. A and B are provided with tanks, and have bottom ventilation; C is a hot-air non-moisture machine, in which the circulation is downwards. The Clive (D) is a new form of incubator sent for trial. At the College Poultry Farm the machines are worked by students, under supervision of the practical instructors, Messrs. T. and W. Brown, but in the case of the Clive it was operated entirely by the instructors, and some at least of its success may be attributed to expert control, as its regulation was not nearly so steady as in the others. From 23rd May to 11th June, 1903, the variations recorded in the last-named machine were from 94 degrees to 101½; and from 18th June to 8th July, 1903, from 94 degrees to 102½. Table II., on page 141, gives the record of each machine during the 12 months, showing (1) number of eggs placed in machine; (2) number of fertile eggs as revealed by testing on the 7th day; (3) number of chickens hatched, and (4) percentage of fertile eggs hatched. The true test of any incubator is its results in regard to fertile eggs, as the non-fertiles should not be included in calculation of percentages.

It is interesting to note the records of various machines, though special circumstances may explain why results are sometimes less satisfactory at one time than at another.

Month.	Class of Machine.	Highest Hatching Percentages.	Class of Machine.	Lowest Hatching Percentages.
1903.				
April	B.	92·10	A.	51·02
May	B.	91·3	B.	63·29
June	C.	88·68	C.	67·5
July	B.	92·3	A.	62·22
August	C.	84·72	C.	64·22
September	A.	84·21	A.	75·51
1904.				
February	B.	88·88	C.	55·68
March	A.	82·89	C.	50·0

It is suggestive that in this connection all the highest percentages were obtained by machines in which after testing, the removal of the non-fertile eggs reduced the number remaining much below the capacity of the egg chamber, indicating that overcrowding is undesirable in the embryonical stage of a chicken's development.

During the year under review testing of the 13 incubators worked revealed 3,674 of fertile eggs, and from these 2,572 chickens and ducklings were hatched, giving the percentage of a fraction over 70, which cannot but be regarded as satisfactory. The monthly averages are shown below:—

Month.	No. of Hatches.	Fertile Eggs Hatched.
1903.		
April	12	71·48 per cent.
May	10	76·38 " "
June	12	78·03 " "
July	5	81·12 " "
August	2	72·38 " "
September	2	79·31 " "
1904.		
February	8	67·94 " "
March	11	75·4 " "

TABLE II.—*Hatching Records.*

Date of Hatching.		Class of Machine.	No. of Eggs.	No. of Fertile Eggs 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
1903.						per cent.
April	1 ...	B.	61	38	35	92·10
,,	4 ...	B.	108	88	61	69·31
,,	6 ...	C.	48	34	29	85·29
,,	6 ...	A.	55	46	32	69·56
,,	14 ...	C.	118	103	77	74·75
,,	15 ...	B.	96	74	47	63·51
,,	17 ...	A.	57	49	25	51·02
,,	18 ...	A.	110	87	58	66·66
,,	19 ...	C.	123	108	67	62·03
,,	24 ...	C.	51	46	31	67·39
,,	28 ...	A.	56	47	42	89·36
,,	29 ...	C.	74	69	60	86·95
May	2 ...	B.	48	23	21	91·3
,,	7 ...	B.	95	80	62	77·5
,,	7 ...	C.	67	63	49	77·77
,,	8 ...	C.	43	31	25	80·64
,,	10 ...	A.	56	50	36	72·00
,,	18 ...	A.	60	48	43	89·58
,,	20 ...	C.	36	28	25	89·28
,,	25 ...	B.	94	79	50	63·29
,,	25 ...	B.	61	48	32	66·66
,,	29 ...	A.	92	75	58	77·33
June	1 ...	A.	33	24	21	87·5
,,	2 ...	C.	51	40	27	67·5
,,	2 ...	B.	68	62	46	74·19
,,	7 ...	C.	38	32	26	81·25
,,	8 ...	C.	53	42	35	83·33
,,	12 ...	D.	48	37	26	70·27
,,	15 ...	A.	32	26	22	84·61
,,	26 ...	B.	66	52	41	78·84
,,	26 ...	C.	62	55	43	78·18
,,	26 ...	C.	60	53	47	88·68
,,	26 ...	A.	120	98	72	73·46
,,	29 ...	B.	49	39	31	79·48
July	2 ...	C.	50	39	32	82·05
,,	3 ...	B.	32	26	24	92·3
,,	5 ...	A.	54	43	38	88·37
,,	9 ...	D.	49	48	41	85·41
,,	13 ...	A.	56	45	28	62·22
August	4 ...	C.	120	109	70	64·22
,,	31 ...	C.	100	72	61	84·72
Sept.	2 ...	A.	60	49	37	75·51
,,	2 ...	A.	50	38	32	84·21
1904.						
Feb.	6 ...	A.	40	27	23	85·18
,,	9 ...	B.	39	18	16	88·88
,,	11 ...	C.	57	44	25	56·81
,,	15 ...	C.	110	88	49	55·68
,,	18 ...	B.	85	61	42	68·85
,,	25 ...	C.	105	78	62	79·48

TABLE II.—*Hatching Records*—continued.

Date of Hatching.	Class of Machine.	No. of Eggs.	No. of Fertile Eggs 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
1904.					per cent.
Feb. 25 ...	B.	40	30	18	60·0
„ 29 ...	B.	100	72	49	68·05
March 6 ...	C.	220	169	105	62·13
„ 7 ...	A.	24	21	16	76·19
„ 10 ...	C.	187	137	88	64·23
„ 14 ...	C.	120	102	51	50·0
„ 19 ..	A.	100	76	63	82·89
„ 19 ...	C.	120	96	55	57·29
„ 24 ...	B.	61	55	27	49·09
„ 25 ...	B.	47	31	16	51·61
„ 25 ...	A.	97	74	54	72·97
„ 25 ...	B.	98	90	68	75·55
„ 30 ...	C.	180	149	111	74·49

It is evident that we cannot expect the same average results out of what may be termed the natural period of hatching, viz., March to July, probably owing to the fact that the germs within the eggs are more vigorous at that season.

Much controversy has arisen as to the relative merits of tank and hot-air machines, and it is interesting to study the comparative results in hatching, though probably the advocates of each system may be surprised that these vary so little.

TABLE III.—*Hatching Results in Tank and Hot-air Incubators.*

Month.	Tank Incubators.		Hot-air Incubators.	
	No. of Hatches.	Percentage of Fertile Eggs Hatched.	No. of Hatches.	Percentage of Fertile Eggs Hatched.
1903.				
April	7	69·92	5	73·33
May	7	69·74	3	81·14
June	2	76·62	2	80·18
July	2	80·86	1	82·05
August	—	—	2	72·38
September	2	79·31	—	—
1904.				
February	5	71·1	3	64·76
March	6	70·31	5	66·15
Year's Average ...	31	70·89	21	68·95

It is desirable to mention that in an incubator house such as that in which these observations were made, the steadying ad-

vantages of tanks in meeting great variations of temperature are not so much in evidence as would be the case under less favourable conditions, whilst, on the other hand, in the hot-air machines there would be a lessened stress on the regulating apparatus, due to the avoidance of extremes. It is important, therefore, to keep that fact in mind, for the results might be entirely different where the atmospheric influences were nearer to the ordinary temperatures of both day and night. The night-time is most dangerous in winter, and the daytime in summer.

Taking the entire year, the tank machines have given the higher averages, but on reference to Table III. it will be seen that in four months the hot-air incubators were in advance of the tank incubators. The records of the various types of machines employed, taking the entire period of 12 months, were as follows :—

Class of Machine.	No. of Hatchings.	Hatching Percentages of Fertile Eggs.
A.	18	75·83
B.	18	71·01
C.	24	69·94
D.	2	78·82

The great majority of the eggs hatched were from hens, as natural methods are chiefly employed for duck eggs on the College Poultry Farm, Theale, but six hatches of the latter were made by artificial methods, the results of which were as follows :—

Date Hatched.	Class of Machine.	Fertile Ducks' Eggs Hatched.
1903.		
May 2	A.	91·3
„ 8	C.	80·64
July 3	B.	92·3
„ 5	A.	88·37
1904.		
March 7	A.	76·19
„ 25	B.	51·61

Two of the highest records, above 90 per cent., were made with duck eggs, but confirmatory of what has already been stated, in each of these cases the machine employed was not worked at its full capacity.

The result of these observations prove that hatching houses can be successfully employed on a larger scale than has hitherto been thought desirable, and that a percentage of hatching may be obtained of more than 70, even where the operators have not had much experience. But to secure this result the conditions must be favourable, more especially in respect to ventilation.

HINTS ON LAYING DOWN LAND TO GRASS.

The utility of forming artificial pasture for stock, though generally recognised, is not so frequently practised as might be advantageous; for, by means of it, not only double, but in some cases four times the amount of food may be obtained from an acre of land than it would produce under natural grasses. In such varieties of soil and climate as exist in this country, different modes of preparing the ground for the reception of grass seeds must be followed. In some rich soils, where the climate is moist, good results are obtained from sowing the seeds in the ashes of the burnt scrub, at the rate of 30lbs. to the acre, without any other cultivation; but such a mode would be inefficacious in ordinary soil, which requires to be well and deeply tilled before the seed is sown. The method of sowing grass seeds with a grain crop, as practised in more temperate climates, is entirely unsuited to this country, and should never be practised. Whether the land is new or old, it should be broken up by ploughing and subsoiling in the course of the previous season; then, on the approach of seed time, well worked and brought to a fine tilth with cultivator, roller, and harrow, any rubbish being gathered and burnt, and the ashes spread. The ground will then be ready to receive the seed, which should be put in as soon as the land is sufficiently moistened by the autumn rains. Grass seeds should be lightly covered with a bush harrow, and the ground immediately rolled; but if clover seed is added, it may be sown after the ground is harrowed, and covered by the roller. Grass should not be allowed to seed the first year, as that tends to cause the plants to die out; as soon as the flower stems appear, it should be cut with a scythe, or fed off by young cattle, but it must at no period, and especially during summer, be eaten bare. The seed should not be stinted in quantity or variety, as better crops are obtained where different sorts are grown together and the ground well covered, which can only be attained by using a sufficiency of seed; and though that is not always done, it is decidedly uneconomical to limit the quantity. No less than 40 to 50lbs. to the acre should be sown on ordinary soils, with clover seeds in addition. With regard to the proportion of the different kinds to use, that depends so much on the nature of the soil and the kind of stock to be grazed, that no definite list can be given that would be suitable everywhere. The permanency of pastures depends even more upon the good management they receive than upon any other circumstance, for the best pastures will succumb if grazed bare in hot weather; and, therefore, the only sure policy is to use the paddocks alternately, so that each may have time to recuperate while the others are being grazed. In soils that are not very rich, it is advisable to top-dress the ground with manure the following spring after sowing. Natural pastures may

be improved to a certain extent by sowing grass seeds and harrowing them in, without the ground being prepared; but the benefit to be derived is seldom commensurate with the expenses incurred.

CRESTED DOGSTAIL (*Cynosurus cristatus*).—Perennial; height, 1 to 1½ feet. A valuable, fine, short grass. It forms a close, dense turf of graceful nutritive herbage, and is little affected by extremes of weather. Stock of all kinds, especially sheep, are very fond of it, until it commences to ripen, when it becomes wiry. On account of its close-growing habit and evergreen foliage, it is particularly valuable for lawns, tennis grounds, etc., and other places kept under by the scythe. It succeeds well in Gippsland, and is a capital winter grass. From 3 to 6lbs. per acre may be sown along with other grasses. The late Dr. Schomburg, of Adelaide, in one of his reports on his experimental grass plots during the continued drought of the eighties, states: "The drought had no effect on crested dogstail (*Cynosurus crystatus*). All stock are fond of it, and it forms a close sward."

HARD FESCUE (*Festuca duriuscula*).—Perennial; height, 1½ feet. A dwarf-growing, hardy, and robust grass. It is one of the most valuable and important of the fescue tribe of pasture grasses. It retains its verdure during continued drought in a very remarkable manner, and is one of the best of pasture grasses. All kinds of stock eat it with avidity, but especially sheep, which always thrive well on the succulent herbage it produces. From the fineness of its foliage and evergreen appearance during winter, it is eminently adapted for sowing in parks and ornamental grounds. Sow (if alone) 40lbs. to the acre.

RIB GRASS (*Plantago lanceolata*).—Perennial; height, ½ foot. Is one of the best-known of our grasses, and holds a place in almost every pasture. Its root is perennial; its leaves are numerous, lanceolate acute, tapering towards both ends, spreading or prostrate, and of a deep green colour, and they stand upon broad, flat, ribbed footstalks, and are accompanied at their insertion with large tufts of soft, white, woolly fibres. It produces its foliage at an early period of the year, and is readily eaten by cattle, sheep, and horses, and is therefore to be recommended as an ingredient in all mixtures for spring and summer pasturage. Sow, with other grasses, 2lbs. to the acre.

MEADOW FOXTAIL (*Alopecurus pratensis*).—Perennial; height, 2 feet. This is one of the most desirable of all grasses for permanent pasture, being early and rapid in growth. It thrives best on well-drained, rich, loamy, and clayey soils, and makes excellent hay. It is eagerly eaten by all kinds of stock. Being somewhat coarse in habit, it is not suitable for lawns or bowling-greens. It is admirably adapted for irrigation, as it grows very early pasturage, and soon revives again with water. Sow (if alone) ·15lbs. to the acre.

TALL FESCUE (*Festuca elatior*).—Perennial; height, 2 feet to 5 feet. This is a very productive and strong-growing variety,

and is greatly relished by stock, both as hay and green food. It is most suitable for moist and strong soils, and is considered to be one of the best grasses in cultivation. Being very tall, it is not suited for lawn purposes. Sow (if alone) 40lbs. to the acre.

PRAIRIE GRASS (*Bromus unioloides*).—Perennial; height, 2½ feet to 3 feet. This is one of the most nutritious of fodder and pasture grasses. It produces enormous crops, and can be cut four or five times a year, providing it is not allowed to go to seed. It succeeds well in almost any soil, but prefers that which is wet or moist. Stock will eat it greedily, either in the green or dry state. A small proportion of it is valuable in mixtures, but upon the whole it is best alone. The demand for this grass increases year by year, proving that it will well repay cultivation. Sow (if alone) 40 to 60lbs. to the acre.

COUCH, OR BERMUDA GRASS—Doob grass of India—(*Cynodon dactylon*).—Perennial. Valuable in dry situations. It is of a similar nature to the buffalo grass, but very much finer in appearance. It is exceedingly useful for binding railway embankments, sand-hills, dam and river banks, on account of its long creeping shoots, which root at every joint. It also makes a very good lawn when kept well cut. March, April, October, and November are the best months to sow, as during the cold winter months it is unlikely to germinate if put down. Sow 7lbs. to the acre.

YORKSHIRE FOG, OR WOOLLY SOFT GRASS (*Holcus lanatus*).—Perennial; height, 1½ to 2 feet. Although it is not as valuable as many of the other grasses, nevertheless it will grow well in any description of ground, whether poor or rich, swampy or dry, producing crops under the most unfavourable circumstances. In the interior of central Australia, where rain seldom falls, it is said to succeed admirably. On marshy lands, where scarcely any other kind of grass will grow, it should be sown. Sow (if alone) 20lbs. to the acre.

RED TOP GRASS (*Agrostis vulgaris*).—Perennial; height, 1 to 2 feet. This a valuable variety for permanent pasture, and succeeds almost anywhere, but best in rich moist soil. If for pasture, it should be fed close, as cattle do not relish it after growing up to seed. It is usually sown with timothy and red clover. Sow (if alone) 40lbs. to the acre.

TALL MEADOW OAT GRASS (*Avena elatoir*). Perennial; height, 2 to 4ft.—A most valuable grass for pastures on account of its early and luxuriant growth. It succeeds well on sandy soils, and also withstands drought better than rye grass. Sow (if alone) 40lbs. to the acre.

WOOD MEADOW GRASS (*Poa nemoralis*). Perennial; height, 1½ to 2ft.—This grass, which is common in England in the woods and thickets, has never been used to any great extent for pasture purposes. It is a valuable variety, and is splendidly adapted for moist and shady places and should be included in most mixtures for

permanent pasture. For lawns and pleasure grounds, overshadowed by trees, it is especially valuable. It is of a much thicker growth than either *Poa pratensis* or *trivialis*, and has a rather drooping panicle, supported on a thin stalk, and the leaves are long, narrow, and soft. If sown in good ground of rather a light character it produces a considerable quantity of succulent herbage. Sow (if alone) 30lbs. to the acre.

SHEEP FESCUE (*Festuca ovina*). Perennial; height, 1 to 1½ft.—It is supposed to have received its name from Linnaeus on account of sheep being so fond of it. Gmelin, the eminent Russian botanist, says that the Tartars generally pitched their tents during the summer months in close proximity to it, on account of its value to their herds. A large proportion of this grass should be included in all mixtures for dry districts, especially for sheep grazing, as they greatly relish it. Excellent for its nutritive qualities. Being short and dense in growth, combined with its fine foliage, it is exceedingly valuable for grass plots, etc. Sow (if alone) 40lbs. to the acre.

ITALIAN RYE GRASS (*Lolium Italicum*). Biennial; height, 1½ to 2ft.—A valuable biennial variety, which succeeds well in almost any soil. It yields an abundance of food in the early spring. A little is sometimes introduced into permanent pastures on account of its early growth. Sow (if alone) 40lbs. to the acre.

KENTUCKY BLUE GRASS; known also as smooth-stalked meadow grass, green grass, June grass (*Poa pratensis*). Perennial; height, 1 to 2ft.—It is one of the most popular grasses for pasture purposes in America. It adapts itself to almost any variety of soil, from dry to moist, and yields very productively at an early period of the season (when all other grasses are comparatively dormant) herbage of the most nutritious properties. It is quite distinct from poas in the colour of the foliage and leaves. When once established it will stand the driest summers. For lawn purposes it is exceedingly valuable, forming a thick turf of even growth. It makes excellent hay. Sow (if alone) 40lbs. to the acre.

ROUGH-STALKED MEADOW GRASS (*Poa trivialis*). Perennial; height, 2 to 2½ft.—A valuable grass for good, deep, rich, moist loams, and stiff, heavy clays. It produces a constant supply of nutritive herbage, which is greatly relished by sheep, horses, and cattle. It should be sown in mixture with other grasses for moist and congenial soils Being very tender and succulent, it is not adapted for severe cold situations. In appearance it is somewhat like *P. pratensis*, but very different in habit and general properties. Sow (if alone) 30lbs. to the acre.

MEADOW FESCUE (*Festuca pratensis*), English blue grass; perennial; height, 1½ to 2ft.—One of the best of our natural grasses for permanent pastures, being very early, productive, and most nutritious. It is greedily eaten by all kinds of stock, and has excellent fattening qualities. It succeeds best in moist soils, although it does well in almost any kind of land. In some parts of North America it is said to remain green under the snow throughout

the winter, and is not uncommonly called "evergreen grass." Commander Mayne refers to it thus in his book, *Four Years in British Columbia and Vancouver's Island*:—"Cattle and horses are very fond of *F. pratensis*, or sweet grass, and it has a wonderful effect in fattening them. I have seen horses on Vancouver's Island, where the same grass grows, which had been turned out in the autumn, brought in in April in splendid condition and as fresh as if they had been most carefully treated all the time." Sow (if alone) 40lbs. to the acre.

RED, OR CREEPING FESCUE (*Festuca rubra*). Height, 2 to 3ft.—A valuable grass of creeping habit, excellent for enduring severe droughts. Its roots penetrate so deeply into the soil that it retains its fresh green appearance when all others are burnt up. It is particularly adapted for dry pastures. When just in flower it is more nutritious than at an earlier period. Sow (if alone) 30lbs. to the acre.

COCKSFOOT, OR ORCHARD GRASS (*Dactylis glomerata*). Perennial; height, 3 to 6ft.—Of all the pasture grasses, cooksfoot has now become the greatest favourite with stock-holders and farmers in this colony, and is considered a most excellent permanent pasture grass, the selectors of Gippsland preferring it far before the rye grass. All kinds of stock are fond of it; sheep fatten on it, and eat it most readily; it grows well on high, ridgy land, or in shady places, and stands our summer heat first rate, making it a valuable grass for this climate; it is very productive during the summer, say from the month of September to that of February; if it once gets a good root it will stand both floods and drought; it does well on high light land, which would not be suitable for many of the other grasses referred to; it yields a large quantity of herbage, and from the rapidity of its growth after cutting or feeding off, it is a very desirable grass to introduce into all pastures; it is, perhaps, the hardiest of all perennial varieties. I have no hesitation in recommending this as a pasture grass that must prove of the highest value to all who are engaged in pastoral and agricultural pursuits. Sow on scrub land 20lbs. to the acre.

VARIOUS-LEAVED FESCUE (*Festuca heterophylla*). Perennial; height, 2 to 2½ft.—A native of France, where it is largely grown, especially valuable for permanent pastures on account of its immense yield of herbage. Having beautiful dark green foliage, it is very suitable for parks, ornamental grounds, etc. Sow (if alone) 30lbs. to the acre.

TIMOTHY GRASS (*Phleum pratense*). Perennial, height, 2 to 3ft.—This grass thrives best on moist soils or rich wheat-bearing alluvial clay lands; also on newly-reclaimed moorish soils. It affords twice as much nourishment when its seeds are ripe as when it is cut in flower, and it is peculiarly valuable for either permanent grass or alternate husbandry on strong, stiff, rather moist soils, in consequence of its first yielding a hay crop and still continuing nutritious. It is of strong growth, and yields abundant feed. On

dry soils timothy form a bulbous swelling at the base of the stems, from which next year's growth starts, therefore stock should not be allowed to pasture on it. Sow (if alone) 30lbs. to the acre.

WATER MEADOW GRASS (*Poa aquatica*). Perennial, 2 to 3ft.—This variety is particularly valuable for damp meadows and flooded grounds. In such places it grows luxuriantly and produces a great quantity of herbage, and can be cut three or four times a year. Although rather coarse in growth it is nevertheless very nutritious. Sow (if alone) 28lbs. to the acre.

SWEET-SCENTED VERNAL (*Anthoxanthum odoratum*). Perennial; height, 1 to 1½ft.—It is valuable on account of its delicious perfume, to which our pastures owe so much of their fragrance that it should be included in all mixtures. The scent which it emits is not so discernible in a fresh as in a dry state. Stock relish it greatly in its young state, or when mixed with other grasses; and it is well-known in England that pastures in which this grass abounds produce the finest flavoured meats. Having broad foliage, it is not well adapted for lawns. It is not so productive as some of the stronger growing varieties, such as cocksfoot and meadow foxtail, but is of finer quality and comes early. Sow (if alone) 20lbs. to the acre.

CREEPING BENT, OR FIORIN (*Agrostis alba var. stolonifera*). Perennial; height, 1½ to 2ft.—This grass, although not particularly nutritious for cattle, should be included in permanent pasture mixtures, in consequence of its value in affording herbage early in spring and late in autumn, before and after other grasses have commenced or left off growing. Its long fibrous roots and creeping habit render it valuable in damp or moist situations. Sow (if alone) 25lbs. to the acre.

CHEWING'S FESCUE (*Festuca duriuscula var. Chewing's*). Perennial; height, 1ft.—A variety of hard fescue, successfully grown in Southland (N.Z.), and elsewhere. It thrives luxuriantly on the light, stony soils, and on it sheep fatten rapidly. Its habit is to form a close tuft, and by no means does its roots spread, like many of the other varieties of natural grasses. Sow (if alone) 40lbs. to the acre.

PERENNIAL RYE GRASS (*Lolium perenne*).—Perennial; height, 1½ to 2ft.—This is one of our most largely cultivated and valued grasses, and its merits are becoming more and more recognised every year. It adapts itself to almost any soil, germinating freely from seed, is easily propagated, and seeds abundantly. It is of upright habit, bearing abundance of nutritious foliage, which is at all times relished by stock; it stools out freely, but does not grow in tufts; its roots are fibrous and penetrating, giving it a permanency that does not belong to many others. In selecting this seed, it is advisable to obtain the heaviest samples, which, although perhaps a little more expensive at the outset, will always prove the most satisfactory in the end. Sow (if alone) 40lbs. to the acre.

NEW HUNGARIAN FORAGE GRASS.—It originated in Russia, and is recommended on account of the manner in which it has stood on the Hungary plains, where the dry, sterile nature of the country and the long-continued droughts make so many plants succumb. This, however, stands well, and has been known for thirty years to stand when such robust crops as lucerne have been destroyed. It gives a luxuriant crop, particularly on fresh sandy loam soil, and where the climate is warm. It is found that animals eat it greedily, whether in the green or dry state, so that it can be used as mown or saved for winter use. The seed is sown in the early spring. It is also useful in filling up gaps where lucerne or clover crops have failed, It will stand under favourable conditions for years, and give as much food in one month as lucerne gives in three months. Sutton and Sons, Reading, say:—" It is a perennial, and in our experiments has proved to be one of the earliest grasses to start in the spring. It grows with remarkable rapidity, and yields an immense quantity of succulent herbage, equally suitable for soiling or for ensilage. All kinds of stock eat it greedily, and the analysis made shows that it is richer in flesh-formers than the Italian rye grass."

PASPALUM DILATATUM.—A very valuable hardy grass, producing enormous crops of fodder, and remaining green during the driest summer. It stands out very strongly, and soon fills all gaps if sown very thinly. Four pounds sufficient to sow an acre. An official report from the Department of Agriculture, New South Wales, gives 13 tons 7cwt. per acre as the result of one cutting at the experimental farm, Richmond river, and three or four cuttings a year are predicted. As a pasture it is described as excellent.

CLOVERS

TREFOIL, OR HOP CLOVER. Black medick (*Medicago lupulina*).—This clover is very distinct, bearing a yellow flower, is erect and branching, and yields a large crop. It should be sown sparingly, otherwise it will smother the other clovers. It is useful for sowing with other grasses, at the rate of 2 to 3lbs. per acre. If sown alone it may be cut for hay. This is a clover highly esteemed in England, where it is known under several different names. It grows on any soil that contains lime, and although it is an annual, it seeds itself so freely that it may almost be classed as perennial. Stock of all kinds like it, and it should be included in mixtures for all inferior soils except such as are absolutely devoid of lime. 20lbs. required to sow an acre.

BIRDSFOOT TREFOIL (*Lotus corniculatus*).—Excellent for dry and sandy soils. It is greatly liked by cattle and sheep. Very productive. Perennial.

JAPAN CLOVER (*Lespedeza striata*).—This variety is said to succeed well in any kind of soil—rich or poor, clay or sandy, dry or wet, and is deep rooted. It is also wonderfully fattening. Very distinct.

COW GRASS, OR PERENNIAL RED (*Trifolium pratense perenne*).—This is distinct from the common red clover, possessing a strong and more penetrating root, and is less affected by either drought or frost. It is of quicker growth than the other varieties, and yields an immense crop, which is highly nutritious. This should be introduced into all permanent pastures. 20lbs. required to sow an acre by itself, or 4lbs. if mixed with other grasses.

RED, OR BROAD CLOVER (*Trifolium pratense*).—This variety yields an immense crop, but is only of biennial duration. 20lbs. required to sow an acre by itself, or 4lbs. if mixed with other grasses.

WHITE CLOVER (*Trifolium repens*).—Its proper place and treatment are—prominence among the grasses of a long continuance of artificial pasture, and intermixture with the seeds of those grasses at the time of their being sown. Though creeping and of low growth, it luxuriantly intertwines with the grasses so as to form a thick and massive mat of herbage; and is at once so sweet and so very nutritive as to serve in the highest manner all the immediate purposes of pasturage. Another recommendation in its favour is that it thoroughly withstands the attacks of caterpillars. 14lbs. required to sow an acre by itself, or 2lbs. if mixed with other grasses.

EGYPTIAN CLOVER (*Trifolium alexandrinum*).—A white-flowered variety especially adapted for dry districts. Yields heavy crops.

ALSYKE, OR HYBRID CLOVER (*Trifolium hybridum*).—A perennial variety, hybrid between the red and the white, but of much stronger growth than the latter, and will do well on all kinds of soil, yielding a heavy crop where no other clover will succeed. Alskye clover is highly valuable for permanent pasture. 12lbs. is required to sow an acre by itself, or 2lbs. if mixed with other grasses.

BOKHARA CLOVER (*Melilotus leucantha*).—This variety is greatly cultivated for bees. It attains a height of six feet when in bloom; is very productive, and useful for ensilage. 10lbs. required to sow an acre.

ITALIAN SCARLET CLOVER (*Trifolium incarnatum*).—It yields an abundant supply, and makes a capital hay, which is much relished by all kinds of stock, especially horses. Excellent for an early crop. 14lbs. required to sow an acre by itself, or 4lbs. if mixed with other grasses.

THE APIARY.

USE OF SEPARATORS IN SECTION HONEY.

It is hardly to be expected that apiculture, in all of its ramifications, has attained perfection, says W. M. Whitney, in the "American Bee Journal;" yet we are struck with the wonderful advancement made since the days of the bee-gum, straw-skep, and the box-hive—all through the persistent efforts of investigations and inventors in the art of apiculture. Perhaps the most important of these was the invention of the movable frame hive, which has immortalised the name of Father Langstroth; also, the invention of foundation, the modern system of queen-rearing, etc.; and not among the least of these was the creation of the beautiful one-piece section, to contain, as nearly as possible, one pound of choice table honey, with its face so true that a straight edge would touch at every point on its surface.

The time was when honey was obtained wholly from the brood-chamber by "brimstoning" the bees; later, by cutting it out in chunks (which is still practised in many places); by cutting it from brood-frames it has obtained the name of "chunk honey;" still later, someone conceived the idea of boring holes through the top of the hive and placing boxes over them for the bees to occupy, thus securing a better quality of honey. This was considered a great advancement in apiculture, notwithstanding the combs were built irregularly, as in the brood-chamber. But when the section-case and the beautiful basswood sections came into use honey producers exclaimed "Eureka!"

Yet, on trial, something seemed to be lacking, notwithstanding foundation starters or even full sheets were used. While some were built fairly true and regular, many were bulged on one or both sides, or swung out of line either to the right or left, making it difficult to handle such honey to advantage. Some genius, to control and circumscribe the work of the hive, and overcome this difficulty, conceived the idea of the separator, which, to a degree, seemed to accomplish the desired result. As has been stated, it is hardly probable that perfection has yet been attained; may it not be, then, that in this, as in many other lines of human endeavour, in introducing new methods to overcome obstacles, some underlying principle has been overlooked, which, if understood and applied, would have made the so-called improvement scarcely, if at all, necessary?

During a period of ill-health a few years ago, seeking something light to do, and to think about, I took up apiculture as a pastime. The more it was studied and investigated the more fascinating it became. It became desirable to know the why and

wherefore of certain things; hence the apiary became, so to speak, a sort of experiment station, where many things which have been written, and which appear to have been taken as orthodox, have been tested by actual experiment, and one of these is the use of separators in the production of surplus honey.

I am well aware that a large majority of comb-honey producers believe that the use of separators is an absolutely necessary adjunct in the production of first-class comb-honey. Now, that which the majority recommend and practise, it would seem at first blush, must be correct, and the proper thing to do. But when has there ever been an innovation made that did not fly in the face of the majority? Without dilating upon this thought—which might be carried to a limitless extent—let us come directly to the subject of comb-honey production.

Who among experienced bee-keepers has not seen brood-combs of honey as true and straight as a planed board? I've seen hundreds of them. Whoever heard of separators being used in the brood-chamber? Such honey, if it did not drip, cut into squares, would make as fine an appearance on the dining-table as the most beautiful section honey one ever saw. But, says someone, we are inquiring not about brood-comb, but section honey. That is just what we are coming to. The theory of production of one does not, or should not, differ from the production of the other. There isn't a beekeeper in the country, whose opinion is worth consulting, who doesn't know how to produce frames of comb-honey as true as a planed board, with the use of foundation. With hive levelled, frames of foundation properly spaced, force of bees to occupy every frame, and a good flow of nectar, the bees do the rest. Apply this principle to section honey production, and the same results follow.

I have used all sorts of separators, including the fence, but only in case of a comparatively weak colony do I use them. The fence gives fairly true sections, but with a sort of "washboard" appearance; the solid separator, a smoother appearance, but often a good deal of brace-comb, which, of course, spoils the section for shipping. And, again, where there is a great amount of propolis they make a dauby, dirty mess. Not once in a thousand times do I find brace-comb where no separators are used. Some think that first-class section honey cannot be produced without the use of the queen-excluding honey-board. I have never used it, and not three sections in a thousand has the queen occupied. I think the reason may be the careful spacing of the thick top bars of brood frames. At any rate, I have no use for it for that purpose. The greater part of my honey is produced without separators, and I'd be willing to compare it with the best of separator honey I ever saw. I have sold it to first-class dealers at the top market price, which is as good a recommendation as one should desire. Give me seven-to-the-foot, two bee-way, $4\frac{1}{4}$ x $4\frac{1}{4}$ sections, with full sheets of foundation, the hive level, a full force of good workers, a good flow of nectar—someone else can use the separator.

AGRICULURAL EDUCATION.

DR. COBB'S PROPOSALS.

SCHOOL FARMS.

In view of the fresh interest in this subject, aroused by the proposal by Mr. H. W. Potts that there shall be some connection between the University and the Hawkesbury College, the following extracts are made from a report by Dr. Cobb in 1898:—

It is hardly possible to present the question of agricultural education to a broader form than in my original resolution.

"That the department's effort should be to take the boys and girls from the homes of the people, where it may be assumed that, at the age of 14, they have completed the course prescribed by the Education Act, and, after educating them to the extent that they or their parents wish and can afford, return them possessed of both the desire and the ability to carry on and improve the agriculture of the country in all its branches.

Any Department of Agriculture that honestly endeavours to live up to this ideal will assuredly flourish, and yet I doubt if there is a country or State where this ideal is realised. Not because it cannot be realised, but because of manifestly imperfect methods. Fortunately for us we are still in a young and plastic condition, and, if we study the subject carefully, may with comparative ease avoid the pitfalls that have checked the progress of others.

The commonest failure in agricultural education, it seems to me, is the failure to produce agriculturists. A study of the statistics concerning the graduates from agricultural courses shows that a large percentage of them are not agriculturists—they become teachers, lawyers, merchants, not farmers, the reason being apparently (1st) that the wrong class of students is attracted, and (2nd) that they are educated to feel above personally tilling the soil. I shall return to this point again, but I may say even here that, in my belief, the cause of this failure is that the students are told about agriculture to the exclusion of its practice—they are returned to the country, perhaps with the ability to carry on and improve agriculture, but without the desire to do it, because they have not been taught habits of work, nor allowed to learn the many things which, as in any art, can be learned only by continuously practising the art.

This fault is due in part to the fact that, as a rule, the wrong class of students is attracted, that is, students that, from the outset,

have no intention of devoting themselves to agriculture. No doubt these young people are benefited by the course of instruction they receive, but they are seldom found to take a vital interest in their own instructions, and they constitute a dead-weight that hinders the progress of those who do intend afterwards to devote themselves to agriculture. It is this class of students and graduates who more than any other are responsible for the powerful scepticism that agricultural courses meet with almost everywhere, especially among the farming population.

Another common defect in agricultural education is its cheapness. Many States make it so cheap that many parents and guardians find it actually cheaper to send their children to the college (save the name!) than to support them at home, or at least cheaper than it would be to send them to any other school of equal grade, so off they are packed to the "college," quite likely to swell the class of students who have no intention of ever becoming farmers. Again, the taxpayer may justly complain at having to support the special education of a class, however important that class may be, and as, unless these institutions be self-supporting, taxation has to be increased on their account, it is difficult to see how any other method than that of compelling them to be at least self-supporting can in the long run prevail.

It is worthy of note that the introduction of continuous practice at farming and increasing the fees would both decrease the undesirable class of students, and tend to make the institutions self-supporting. In such an educational institution we should find the condition prevailing which is expressed in my resolution "they or their parents desire and can afford." The students would be there both because they desired to be and could afford it.

Let it not be thought that I am here giving any countenance to the exclusion of the poor. This is a matter that I shall deal with very fully in another part of this report. This brief consideration of some of the chief ideas expressed in my resolution, by showing what to avoid, serves to suitably introduce the subject of

A PROPER COURSE IN AGRICULTURE FOR NEW SOUTH WALES.

Such a course should be comprehensive, thorough in its various parts, and should be uniform throughout the colony. It should not aim too high, and the greatest dread of its administrators should be lest it becomes superficial.

It should be comprehensive to turn out agriculturists having the "desire and ability to carry on and improve the agriculture of the country in all its branches." Its higher branches as well as its lower branches; in common farming, in agricultural teaching, and in the higher walks of experiment and investigation. It should be so thorough as to give its graduates a deserved preference throughout the country. It should be uniform throughout the country,

so as to facilitate comparison of the results in various localities, so as to facilitate the administration by the ready transfer of officers from one part to another, and so as to enable students who so desire to take part of their course in one part of the colony and part in another without any break in the continuity of their course.

It seems quite clear that the course should be divided into two parts—an elementary part, comprising farm schools, distributed over the colony, and an advanced part, where specialists could be trained. At the farm schools the art, or business, of agriculture would mainly be taught, while at the advanced school the science of agriculture would be imparted, and its relation to the art of agriculture fully elucidated.

It is needless to point out that the greatest demand is for farm schools. If ten of these were established they could doubtless be filled at once with students. On the other hand, it is doubtful if the demand for a college, properly so called, is sufficient to justify the large expenditure necessary to its proper equipment.

FARM SCHOOLS.

The farm school should in a certain sense be a school of recipes—it should teach the art of agriculture. It should show the student what to do, and how best to do it. If there is time to tell him why, so much the better, but for the most part there will not be time. For all agricultural operations there are scientific reasons that are entirely and hopelessly beyond the grasp of most agriculturists, yet this need not prevent them from becoming good farmers; in fact, if they waited until they were fully conversant with all that science has to say about their calling they would never have time to till an acre. In the farm school, therefore, the rule should be to teach the best methods of farming, to a large extent regardless of exactly why they are the best methods.

Above all, the farm school should be a place for manual work. Unless the prospective farmer learns to work industriously day after day steadily he will never succeed in his chosen profession. There he will be his own master, and can regulate his own hours of work, so the sooner he learns the habit of working regularly and without oversight the better. Too much stress cannot be laid upon this point. Whether the farm school student intends to earn his living by the labour of his own hands or by managing others he should learn what constitutes a good day's work in each of the numerous kinds of farm work, and there is no way of learning this except by doing the work, not only one day, but for a long succession of days. No amount of being told, or of watching others, will give this required knowledge. Even in case the student anticipates only managing estates and directing work he will not be long in actual life before discovering that his men are very quick in finding out whether "the boss" knows what a good day's work is.

At a farm school, therefore, the doing each day of a fair day's work by each student should be made the basis of the course. This work should be done under good instructors in the shape of competent workmen of the best class, each such workman having with him each day only as many students as he can thoroughly utilise and instruct. Any student who continually fails to satisfy the conditions of a fair day's work may safely be set down as "not cut out for an agriculturist." I would like to add here for the comfort of solicitious parents that I can testify from personal experience and from much observation that, give him regularly plenty of plain wholesome food, a clean body, warm clothing, and nine to ten hours' sleep daily in a comfortable bed, a healthy boy of 16 will not suffer from any amount of hard farm work he can be made to do; on the contrary such hard work will build him up and give him a sound constitution that will be worth more to him than to inherit a fortune.

It may be asked if each student is required to do every day a fair day's work when he is to receive lectures. To this the ready reply is, at such times as are consistent with a farmer's life, namely, in the evening and during "off" seasons. Eight to nine hours' work a day does not incapacitate a student for receiving a lecture twice or three times a week on subjects connected with this work, and these, if added to a fortnight or three weeks given entirely to study and lectures twice a year during the time when work is least pressing, will give sufficient of this class of instruction for a farm school course, and even if they did not, it would be unwise to interfere to any greater extent with the regular farm work.

The farm school should, it seems to me, take boys and girls at the age of not less than 14 to 15 years, and in two years equip them for a profitable life in the profession of farming. The course should connect naturally with the course prescribed for boys and girls in the public schools, and the admission to the course should be at stated intervals by oral and written examination. Only those who prove themselves to have the requisite qualifications should be allowed to enter on the regular course of the farm school; all others should be otherwise provided for, so as not to interfere with the regular course. Students for a partial course might be admitted, but their wants should not be catered for to the disadvantage of the regular students.

The introduction of a strict examination for admission to the farm schools will, of course, bring to light applicants who are not qualified to enter on the course. Such applicants should be provided with a preparatory course which will fit them to enter the regular course. It must never be forgotten that there are young people who have never been given a fair chance. A youth may have bad health, or, having been brought up in the backblocks, may have had no opportunities for schooling, or have had access only to poor schools, or his parents may have evaded the law and

kept him from school. If, at last, he presents himself for admission to the farm school, shall he be refused admission because he cannot pass the necessary examinations? On the contrary, this class of pupil should be provided with instruction that will fit him for admission as soon as possible. I have often observed that the rather mature pupils of this class often make up in earnestness what they at first lack in scholarship, and in the end outstrip all competitors.

Such a class of students are therefore not to be discouraged, but rather specially encouraged. This is the reason that the State should step in and fill the gap that exists in certain special cases between the common school system and the proposed farm schools. It is all the more the duty of the State to do this because the very existence of an intelligent youth lacking the training implies a default on the part of the State as regards his previous training unless, indeed, he be an immigrant. As to the methods of supplying the preparatory course, it should be seen to, first of all, that it in no way interferes with the regular course. The teachers and older pupils might for extra payment take charge of the preparatory course. In this way advanced students of limited means might earn in their spare time something towards paying their own expenses.

Another class of applicants requiring special conditions comprises those who, though nearly qualified to enter on the regular course, are deficient in, say, one branch. It is often advisable to allow such to enter on the regular course on condition that they make up the deficiency within a specified time. Such "conditioned" students again should not be allowed to interfere with the progress of the regular course.

A third class of applicants is found in those who wish for instruction in only part of the course. Such may be admitted and encouraged so long as their presence does not interfere with the regular courses.

Students should, upon application, be admitted to advance standing if they can pass a satisfactory examination on all subjects of the course preceding the standing for which they apply.

Only those who satisfactorily complete the regular course should be awarded diplomas.

It is sometimes sought to justify the expenditure of public money on agricultural education on the same ground as that spent on the public schools. The main opposition to this line of argument comes from those who ask, "Where are you to draw the line. If you grant special privileges to one class you must be ready to grant similar privileges to any class. If to farmers then to mechanics; if to those then to merchants, miners, sailors, fishermen." There is reason in this opposition. It may be said, how-

ever, that if any class have the right to demand special instruction, farmers and graziers might claim preference on account of their number and their vital interest in the welfare of the country. Probably the safest ground to take is that of the State guaranteeing that such special institutions shall be self-supporting.

One great step towards making farm schools self-supporting should be taken early in all new countries securing the reservation of suitable public land, and this is a matter to which more attention might now be given in these colonies.

While the farm schools should be made self-supporting, and therefore a fair fee charged to each student, still no deserving applicant should be turned away because of lack of means. Students who require to do so should be allowed to earn their fees, or some portion of them, by extra work. There is a great variety of such work. Backward or conditioned students require tutoring, and a talented student lacking means could do some of this work. Bursaries and scholarships should be open to competition. These afford opportunities to eke out a scanty purse. By working overtime an industrious and skilful student could partly pay his way. A student really anxious to earn his way through the farm schools would be willing to do almost any sort of extra work, and such a spirit would readily secure him an opportunity to partly or wholly pay his way. After completing a part of his course a student might drop out for a year, and, by working, save enough to enable him to then go on and complete his course.

The number of farm schools that would be suitable for the colony is a matter for the future. All that can be said at present is that the number could be profitably increased and that the new schools should be located with due regard to population, local agriculture, and climatic conditions. It is very likely that ten such schools would receive popular approval, especially if they were conducted on self-supporting lines, so as to turn out business-like farmers.

A student's written promise to pay, if properly drawn up, might with propriety be accepted by the State. Additional security could also be afforded the State through life insurance policies. This would enable almost anyone of ability to pass through the course offered by a farm school.—*Sydney Daily Telegraph.*

AN AUSTRALIAN FODDER PLANT FOR THE ARID INTERIOR.

(*Portulacaria Afra. Jacq.*)

The following appeared in the New South Wales *Agricultural Gazette* recently:—

It is self-evident that it is desirable to grow any good fodder plant that will flourish in the arid interior. Our choice of plants for such situations is not great. Let me draw attention to what Don calls the African purslane tree. The Boers of South Africa name it spekboom (fat tree). It is a tall shrub or small tree, growing up to 10 or 12 feet in height. It has small, round, fleshy leaves, which is not surprising, since it belongs to the *Portulaca* family, of which we have one specially-useful member in this country, the common purslane (*Portulaca oleracea*), which has enabled many a mob of cattle to traverse a waterless stage.

Following is what Baron von Mueller says of the purslane tree in his *Select Plants*:—"Affords locally the principal food for elephants; excellent also for sheep pasture, according to Professor McOwan; hence this succulent shrub may deserve naturalisation on stony ridges, and in sandy desert land not otherwise readily utilised. Would likely prove acceptable to camels also. Mr. T. R. Sims states that all kinds of pasture animals eat it readily, and when grass is scarce nearly live on it. Grows on hot rocky slopes. Likes particularly doleritic soil. Displays an extraordinary recuperative power when broken by browsing animals, or when injured from other causes. The trunk will attain one foot in diameter (McOwan). Cultivated by the author already in Victoria 40 years ago."

Its native home is the Karoo, the arid country in South Africa, which appears to present so strong a resemblance to much of our far interior. I cannot find any record of it having been tried in the far West, and I recommend it for careful trial for the following reasons:—

(1.) It may be readily propagated, rooting readily from cuttings, and even solitary leaves, during the greater part of the year.

(2.) It has no thorns or prickles, nor any objectionable characteristics that I know of.

(3.) Like many succulents, it attains its greatest luxuriance in hot, dry localities.

(4.) Stock are fond of it, its succulent leaves providing both food and water for them; it is reputed to be moderately nutritious.

I am not inclined to go into ecstasies over any plant, but I see no reason why this one should not usefully supplement the scanty vegetation of our desert country. South Africa has put some of our salt-bushes to good use; let us make use of her purslane tree by way of reciprocity.

It is a very brittle plant; hence stock easily break the plants up in their eagerness to eat them. The same thing applies to the Old Man Salt-bush, which will assuredly become extinct unless it is protected. This salt-bush and the purslane tree should be fenced in and cultivated, until a considerable number of plants have been raised. A reserve stock should always be kept in what may be called the "nursery." By the way, there should be a nursery on every selection and station for the propagation and acclimatisation of desirable plants.

There has been published in the *Journal* of the Bureau of Agriculture from time to time a number of letters from residents of the North-West, descriptive of the indigenous valuable fodder plant known locally as the "milk-bush." The writers all agree as to its value as a fodder plant in the arid districts, and that it will not stand over-stocking. In many sections it has already from this cause entirely disappeared. To quote from Mr. G. J. Brockman—"It is a plant now only to be remembered by its name in the North." It is a pity that some measures have not been devised for its preservation in the districts where it has been entirely eaten out. The Bureau is endeavouring to raise plants from seeds and cuttings, and, if successful, young plants will in the near future be available for distribution. Under date of 29th December, 1896, Mr. G. J. Brockman sent the Bureau a number of specimens of the bush, also a pod of seed. The latter, he writes, "is very poor quality, owing to the drought." The Bureau is also indebted to Mr. A. J. Ogilvie for specimens of seeds and plants. Photographs have been taken of the plant (an illustration of which is given) and specimens sent to Mr. F. Turner, F.L.S., for identification and description, who reports as follows:—

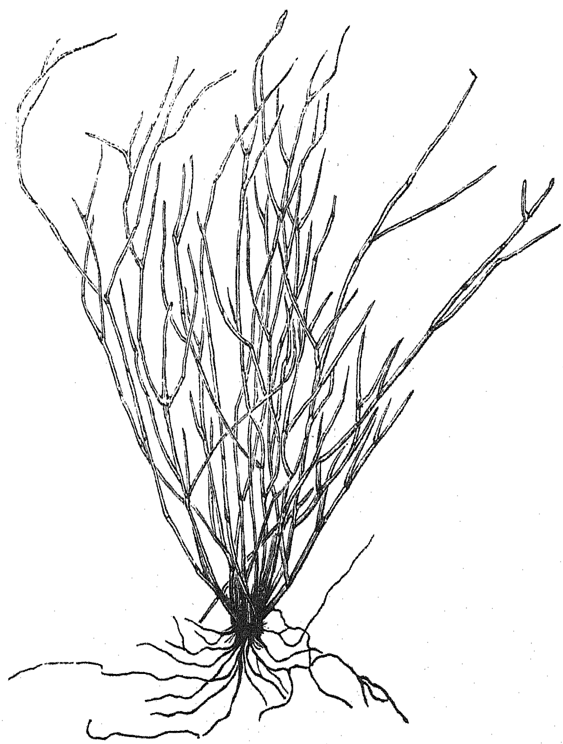
"The 'milk-bush' belongs to the order *asclepiadeæ*. *Sarcostemma Australe*, R. Br.

"*Etymology.*—*Sarcostemma*, from sarx, sarkos, flesh; and stemma, a crown, in reference to the thick, fleshy nature of the inner corona. *Australe*, Southern.

"*Diagnosis.*—A glabrous, leafless, somewhat fleshy twiner, woody at the base, the branches cane-like, round, often articulate at the nodes, the leaves replaced by minute opposite scales. Umbels sessile on one side of the nodes between the scales. Pedicels about a quarter of an inch long. Calyx-segments ovate, obtuse, scarcely half a line long. Corolla white, deeply divided into ovate obtuse lobes of about two lines. Outer corona aduate to the base of the gynostegium and about half its length, much undulate and sinuate, but not lobed; the segments of the inner corona saccate, fleshy, nearly as long as the anthers. Follicles (pod-like

fruits) rather narrow, two or three inches long. These are full of seeds, each one of which is surmounted by a tuft of silky-white hairs. This is the only known species in Australia, and is endemic. *Flora Austr.*, vol. iv., p. 328.

" *Remarks.*—The plant is found in all the Australian colonies, but is more abundant in the warmer portions of the continent. It abounds in a milky juice, which is said to be used by the aborigines of Port Darwin as a remedy in cases of small-pox. In the *Botanical Magazine*, Dr. Hooker, in describing *Sarcostemma brunoniana*, an Indian species somewhat similar to the Australian plant, says:— 'It abounds in milky acid juice, and is hence eaten by the natives as a salad, and sucked by travellers to allay thirst, thus forming a remarkable exception to the usually poisonous nature of the *Asclepiadeous* juices.' A plant (*Marsdenia leichardtiana*) closely allied to the *Sarcostemma*, is figured and described in my work on the



THE MILK BUSH—(*Sarcostemma Australe*, R. Br.)

'Indigenous Forage Plants of Australia.' It is called 'Dooba' by the aborigines, and before they tasted the sweets of civilisation it was of considerable economic value to them. The blacks dig up the roots, roast and eat them, and they also roast the young fruits,

the seeds of which are considered a delicacy. All parts of the *Marsdenia* abound in a viscid, milky fluid of pleasant taste. It is a capital forage plant, and both sheep and cattle eat the young shoots with avidity, and they seem to thrive on them.

"Bailey and Gordon, Queensland, list *Sarcostemma Australe* amongst the plants reputed poisonous and injurious to stock, and cite two instances of cattle and sheep being poisoned through eating the plant."

CO-OPERATIVE POULTRY SOCIETIES IN IRELAND.

(Continued.)

"There were also some expenses, amounting to about £20, for the repairing of the old houses and rendering them fit for the society's business, but from these figures it may be seen that the actual money required to start a poultry society is only about £100. It is also necessary, however, that there should be an additional sum of £200 or £300 in the hands of the committee, for the purpose of carrying on the business, for the egg trade is done on a strictly cash basis. All eggs must be paid for when they are received, and when they are sold in England or in Scotland it takes nearly two weeks from the day on which they are purchased until the cash returns come in from the egg merchants who buy them. Therefore, if a society is handling £100 worth or £200 worth of eggs per week, as Dervock Society would be during the busy season from March to August, it would be necessary to have a sum of £200 to £400 in hand. This working capital is provided partly by the paid-up share capital and partly by a bank overdraft. All the Irish banking companies have now agreed to lend money to poultry societies at the rate of 4 per cent. per annum, calculated from day to day on the actual amount which the society has drawn out. This is a very great concession, for there was a time, not many years ago, when bankers charged co-operative societies a very high rate of interest, and were not always willing to lend them money on any terms.

"A poultry society could make a fair start and carry on a successful business even on a smaller investment than £100, provided that sufficient working capital for current expenses were available. It may be seen from the above table of figures that Dervock Society owns a horse, van, and harness, and also has put in an acetylene gas plant. A society could do very well without these, although it is more economical to have them from the start. Horses can be hired to collect the eggs and do other work, and

Dervock Society employs three or four horses for these purposes. Considering the little night work done, it is not absolutely necessary to have an up-to-date gas plant, and cheaper light might be provided; yet I strongly approve of the acetylene gas installation, as it is most useful for thoroughly testing the eggs. If the cost of these items were omitted, a poultry society could start business with an investment of £40 to £50, and very many of our societies have actually started with a smaller capital.

"For the purpose of collecting all the eggs regularly and of ensuring perfect freshness, the society's district has been subdivided into four smaller districts, and each of the four collectors employed has charge of one of these sub-districts. He is furnished, to start with, with a list of the names of all the members in his district, and he is bound to call on each of them at regular stated times. In winter time, when eggs are scarce, his visits are made once a week, but when the weather is warm, and eggs are in danger of becoming stale quickly, he makes his rounds two or three times a week. After a few weeks of this work, the collector knows his circuit very well and is personally acquainted with almost every member in it. He does not call on residents who are not members, nor has the society any dealings with them.

"The collectors are instructed to buy only clean fresh eggs, and they may refuse any which are dirty or stale looking. They do not take a testing machine on their rounds, but with some practice they learn to know a fresh egg when they see it, and there is but little danger of their accepting any eggs which are below the standard quality required.

"The eggs are bought by weight, and for this reason the collectors take a small weighing machine with them. They also take duplicate docket books and a supply of silver and copper money. They pay for the eggs as they are bought, record the transaction in the docket book, and give each supplier a docket showing the weight and price of the eggs. The eggs are not counted at all. They are packed down carefully in large boxes, with a layer of straw between every two layers of eggs, and in this manner they are conveyed to the packing store. They are then unpacked and checked by weight. The docket books are made up, the cash in hand is counted, and by these means the work done by the collectors is kept under the control of the manager.

"When the eggs arrive at the store they are supposed to be in a sound, clean, and fresh condition, but it must not be taken for granted that they are so, and therefore they are carefully tested to see that the shells are sound and the contents quite fresh. This work is done by an expert, who uses a special testing machine lighted by four powerful jets of gas. Any eggs which are found to be musty or stale are destroyed and there is no more about them, but the proportion of loss is very small—not more than one to three per cent.

"The eggs are next separated, according to weight, into several regular sizes. At Dervock the selections are eggs weighing 13½lb. per 120, 15lbs. per 120, and 17lbs. per 120, and then they are sold by weight. The demand for large eggs is very great at all seasons, and the price which they realise is much higher than that received for the smaller grades. About Christmas, when eggs are at their dearest, 17lb. eggs are worth about four shillings per 120 more than 13½lb. eggs.

"The improved system of buying eggs by weight instead of by count, which has been introduced by the co-operative societies, has since been largely adopted by other dealers, and there can be no doubt that it will have a more speedy and far-reaching effect in the improvement of the poultry industry of Ireland than any other reform which could be introduced. Practical poultry-keepers know that they can produce eggs of very fine size and quality by giving due attention to the breeding selection, care, and management of poultry. It is worth while to do this when the result is an increased price for the eggs, and it does not cost any more to produce large eggs than it costs to produce small ones.

"In support of this, I will give some figures showing the benefits of buying and selling eggs by weight. Of the eggs purchased by Dervock Society two years ago, 40 per cent. weighed 13½ lbs. per 120; 40 per cent. weighed 15lbs. per 120; 20 per cent. weighed 17lbs. per 120, and there were no eggs capable of being graded as 18lb. eggs.

"At the present time 10 per cent. weigh 13½lbs. per 120; 30 per cent. weigh 15lbs.; 30 per cent. weigh 16lbs.; 20 per cent. weigh 17lbs.; and 10 per cent. weigh 18lbs. per 120. This must be regarded as an extraordinary improvement, considering the short period in which it has taken place. In cases where our societies have been working during four or five years the increase in the weight of eggs is far greater, and a few quotations taken from the books of Mallow Poultry Society, co. Cork, will suffice to illustrate the benefits which accrue from the system of buying and selling eggs by weight:—Four years ago 50 per cent. weighed 13½lbs.; 30 per cent. weighed 15lbs.; and 20 per cent. weighed 17lbs. per 120. At the present time 30 per cent. weigh 14lbs.; 30 per cent. weigh 16lbs.; 20 per cent. weigh 17lbs.; and 20 per cent. weigh 18lbs. per 120.

"It may be noted that Mallow Society, according to these figures, no longer grades any 13½lb. eggs. The smallest are now 14lbs., and there are only 30 per cent. of these, as compared with 50 per cent. of 13½lbs. four years ago. The 15lb. selection has also dropped out, and its place has been taken by 16lb. eggs, of which there are 30 per cent., or equal to the number of 15lb. eggs received four years ago. Seventeen-pound eggs stand at 20 per cent., but a new selection has been introduced, namely, 18lb. eggs, of which there are 20 per cent.

"The grading of eggs is done in some cases by the sight and in others by the touch, and according as they are selected they are placed on the special trays shown in the illustrations. These trays are made after a model lately introduced from Denmark. They are made of perforated mill-board of best quality, nailed on a frame of light deal. Each tray weighs 5lbs., and contains 120 perforations. When the eggs have been graded on the trays, they are placed, six trays at a time, on a scale, in order to see that they are neither over nor under the weight required. They can then be guaranteed as of a certain weight and sold as such without any doubt or question.

"The trays described are also used for testing the eggs. A square box lined with bright tin is fitted up in a dark corner of the packing store. Inside this box there are four jets of gas, and by placing the perforated tray filled with eggs on top of the box, all the light passes through the eggs. The man who is testing can then see if there are any cracked or stale eggs, and the testing of 120 eggs, when they have been placed in the tray and held over the light, takes only half a minute. This is a very great improvement on the old system of holding the eggs up to a candle or lamp, three at a time, and testing them slowly and laboriously.

"The eggs are now ready for packing in the cases which are to convey them to one or other of the large towns or cities of Great Britain. Non-returnable cases are used, as required by the British trade, and they hold either three hundreds, six hundreds, or twelve hundreds of eggs each. A hundred of eggs is 120, which is called 'a long hundred.' As the cases are required for only one journey, it is not necessary that they should be made of high-priced durable wood. On the contrary, the lightest and cheapest quality suits very well, and it is usually sawn by local sawmills from deal, poplar, lime, or some similar native timber.

"It is most important that the cases should be accurately sawn, in order that they may be neither too large nor too small for the number of eggs they are required to hold. In the one case it would be necessary to use extra packing material, and in the other the eggs might get smashed for want of sufficient packing or on account of tight packing. The cases must be of different sizes, to suit the size of the eggs. For instance, a case which will be just the right size for twelve hundreds of 13½lb. eggs will not suit at all for twelve hundreds of 17lb. eggs. The exact sizes which are most suitable for the eggs of various grades have been ascertained by experience, and the society supplies the sawmill owner with a specification of the timber required, which is as follows:—

No. 1.—To contain twelve hundred 17lb., 18lb., or duck eggs.

	In.	In.	In.
Four end pieces	24 ×	10 ×	$\frac{7}{8}$
Two side pieces	80 ×	10 ×	$\frac{3}{8}$
Six top and bottom pieces ...	80 ×	8 ×	$\frac{3}{8}$

No. 2.—To contain twelve hundred 13½lb., 15lb., or 16lb. eggs.

	In.	In.	In.
Four end pieces	22 ×	9 ×	$\frac{7}{8}$
Two side pieces	76 ×	9 ×	$\frac{3}{8}$
Six top and bottom pieces ...	76 ×	7 ×	$\frac{3}{8}$

No. 3.—To contain six hundred 17lb., 18lb., or duck eggs.

	In.	In.	In.
Two end pieces	24 ×	10 ×	$\frac{7}{8}$
Two side pieces	40 ×	10 ×	$\frac{3}{8}$
Six top and bottom pieces ...	40 ×	8 ×	$\frac{3}{8}$

No. 4.—To contain six hundred 13½lb., 15lb., or 16lb.

	In.	In.	In.
Two end pieces	22 ×	9 ×	$\frac{7}{8}$
Two side pieces	38 ×	9 ×	$\frac{3}{8}$
Six top and bottom pieces ...	38 ×	7 ×	$\frac{3}{8}$

No. 5.—To contain three hundred 17lb., 18lb., or duck eggs.

	In.	In.	In.
Two end pieces	24 ×	10 ×	$\frac{7}{8}$
Two side pieces	24 ×	10 ×	$\frac{3}{8}$
Six top and bottom pieces ...	24 ×	8 ×	$\frac{3}{8}$

No. 6.—To contain three hundred 13½lb., 15lb., or 16lb.

	In.	In.	In.
Two end pieces	22 ×	9 ×	$\frac{7}{8}$
Two side pieces	23 ×	9 ×	$\frac{3}{8}$
Six top and bottom pieces ...	23 ×	7 ×	$\frac{3}{8}$

"The timber is sawn into boards of these dimensions and sent to the society's stores, where they are nailed together to form boxes and put into a shed to become seasoned and dry. The twelve-hundred cases are double the length of the six-hundred cases, and they contain two ends in the middle, as it were. Thus a twelve-hundred case is really two complete six-hundred cases, and the object of having it made in this form is that the buyer may divide it into six-hundreds if he wishes by sawing through the middle.

"The packing material used consists of either wood fibre or perfectly dry oaten straw. When straw is used it is bought from some farmer in harvest-time and stored in a shed or loft, so that when required for use it may be quite dry and free from mustiness. This is of the utmost importance, because eggs would assume a musty flavour in a day or two if packed for transit in damp and musty straw. Wood fibre, or wood-wool, as it is also called, is made by special machinery from soft woods, and is then dried and pressed into bales of 1cwt. each. It is largely manufactured in Ireland, and the societies obtain it from Dublin, Belfast, or Cork. It is considered a cheaper packing material than straw, although it costs £5 per ton, when straw can be bought at £2 or £2 10s. This is because it goes farther than straw. Some merchants prefer straw packing, and others like wood-wool better, so that societies must stock both materials in order to please all their customers.

"A case of eggs contains only one size or grade, and they are packed in four layers, with a layer of packing material on the bottom, another on the top, and one between every two layers of eggs. The lid is securely nailed down and marked on top as follows:—'Irish Eggs'; 'With Care'; 'This Side Up'; 'Keep Dry.' The ends of the cases are branded with the trade mark of the society, and with figures indicating the number and weight of the contents.

"All the eggs are sold at net prices f.o.r. at the nearest station, and when the railway company takes them in hand the society has no further responsibility, and if there are breakages, delays, or any other mishaps, they are settled between the purchaser and the railway company.

"So far as the egg department of a poultry society is concerned, success may be measured by the increase in the size and weight of the eggs, about which I have written above, and also by the improved price which the members realise as compared with the price which they could make when handling eggs by the old system. I have made particular note of the prices paid to members, and also of prices obtained from the English buyers, and I am quite satisfied that a well-managed up-to-date society pay for eggs at the rate of at least two-pence per dozen above the price which used to obtain in the district before its establishment. The increase in price has been brought about by the immensely improved method of doing business, and also by the cutting out of middlemen. It is a well-known fact that in egg business there are far too many middlemen, and that by the time each one has had his quota of profit there is little or no profit left for the producer. Of course, we cannot do without middlemen who carry on a legitimate trade and retain only a fair profit, but it is a fact that half the eggs which are produced in Ireland pass through the hands of at least six middlemen from the time they leave the farmer's yard until they appear on the breakfast table of the consumer in Glasgow or London.

"To the uninitiated it may seem that an increase of twopence per dozen is hardly worth talking about, but let us consider what it means to the poultry-keeper. A farmer keeps, say, 100 hens of a pure breed, such as the Leghorn or the Minorca, and of a good laying strain. He has them comfortably housed and sheltered, well fed, and cared for in an intelligent way. The annual yield from such a flock should be an average of 180 eggs per hen—that is, 15 dozen. Under the new system of marketing the eggs fetch two-pence per dozen above what they used to realise under the old plan. Therefore for every hen the farmer keeps he makes half-a-crown per annum more than he was accustomed to make in years gone by; and that without any special breeding, feeding, or management, only because he is a member of a co-operative society.

"I have written so much about the egg department of the societies that readers may assume that the chief function of a

society is to trade in eggs, but although this is true of some few of the societies it is not true of the majority. With many of them the table poultry business is the chief department, but this is of too large and varied a nature to be dealt with within the limits of this article. I may say, however, that it includes the fattening of fowls by the newest and most profitable system, the fattening of turkeys, ducks, and geese, and the preparation and despatch of all these to markets.

"Amongst the other functions of poultry societies there are two which are deserving of special mention, viz., (1) the improvement of the breeds of fowls and poultry of all kinds, which is effected by the importation of stock birds of good quality and the distribution of them at the lowest possible price amongst the members of the society; and (2), the distribution on the most favourable terms of poultry-keepers' requirements, which include incubators, portable fowl-houses, feeding troughs, etc., and also feeding stuffs, tonics, medicines, grit, etc.

"The Irish poultry industry undoubtedly faces a great future, and every intelligent person now admits its enormous importance. The time has passed when poultry-keeping was looked upon as something small and unimportant. The only things which hamper its higher development are the modes of transit and the high freights charged by the carrying companies. We have the advantage over foreign countries of nearness to the markets, mild climate, a plentiful supply of well-sheltered grass runs, and a rural population consisting largely of girls who are not too busily engaged, and might very well employ their spare time in the rearing of poultry.

"Considering tbe small capital required, poultry-keeping yields a greater profit than any other branch of agriculture or country industry, and it is likely to become one of the most profitable rural industries of this island. With even a very small plot of land, anybody who keeps a poultry-yard intelligently and skilfully can increase his income and solve many a difficulty in household economy.

"Co-operation has already taught the farmers and cotters to place on the markets produce which in freshness, cleanliness, quality, and general mode of treatment is on a level with the best produce from other countries, and it has proved by demonstration that it is not quantity but quality which pleases customers, retains their custom, and produces most money."

H. DE COURCY.

IMPORTATION OF POULTRY.

On August 8th a valuable consignment of poultry was landed by the s.s. "Perth" at Albany for the Narrogin Government Experimental Farm. They consist of Silver Wyandottes, Plymouth Rocks, and White Leghorns.

It being as necessary to introduce new blood into poultry as well as other stock, it was decided some time ago to dispose of most of the poultry at present on the farm, and to import a new stock. This having been done, the manager notifies by advertisement in this issue that he is now prepared to receive orders for eggs from these birds. All orders must be accompanied by a remittance for the amount, and when they are consigned to sidings freight must be added. All orders will be executed in the order in which they are received. Settlers who obtain settings of these birds will have the advantage of obtaining stock unrelated to that already in the State. Several unrelated pens of each breed being available, purchasers can, if they so desire, obtain some eggs from each pen, so that when the birds grow up they can be bred from without the necessity of obtaining fresh stock. Some very fine imported Pekin ducks were also purchased at the Perth show, and eggs from these birds are also available at the same price as the fowl eggs, viz., 12s. 6d. a dozen.

DALGETY'S MONTHLY REPORT.

Messrs. Dalgety and Co., Ltd., report as follows in connection with their produce sales held at Perth and Fremantle during the month ended 4th August:—

Weather.—The recent heavy weather throughout the leading agricultural districts has greatly dislocated business in local produce. As a matter of fact, consignments of wheat and chaff are at a minimum, which altered circumstances are reflected in values ruling at Perth and Fremantle.

Wheat.—Local wheat at the beginning of July was in poor request, and farmers' holdings, which were very heavy, were occasioning growers much anxiety. Up till within ten (10) days ago this condition prevailed, but the animated state of the European markets has been reflected in local values, and large parcels of local wheat are now changing hands at rates on a parity with home values.

We are despatching per s.s. "Essex," on the 15th August, a parcel of wheat, which will be the first of any size to have left Western Australia. This wheat is being shipped on account of a number of Western Australian growers, who are anxious to try London market. We favour this system of inducing growers to ship direct, thereby obviating local speculators' profits. Later in the month, it is reported, the ship "Kyber" will take about 600 tons, and will complete loading at Melbourne.

Values at Perth and Fremantle ruled at from 3s. to 3s. 1d. per bushel, but now for many reasons sales are being effected at up to 3s. 3d. per bushel.

Our Melbourne office wired to-day advising that their market for all food-stuffs was advancing and excited.

Chaff.—Throughout July chaff came forward irregularly, prime samples of course being scare, but medium and other grades have practically been in excessive supply, and at the end of July chaff other than prime was becoming almost unsaleable, and this, owing to the greatly reduced consumption caused by the abundant green feed around Perth and Fremantle, and the gradually increasing consignments, greatly aggravated the position.

Closing rates are as follow at Perth and Fremantle:—

Prime green wheaten (good demand) up to £4 12s. 6d. per ton.
Good sound wheaten from £4 to £4 5s. per ton.
Medium samples of wheaten from £3 5s. to £3 10s. and £3 15s. per ton.
Lower grades of wheaten from £2 2s. 6d. per ton.
Prime oaten, none forward (good demand). No price quoted.
Good weedy oaten (fair demand) up to £3 10s. and £3 15s. per ton.

Hay.—There is still good inquiry for stock feed for forward delivery, and, at the time of this report, fair business is being transacted at market rates, which are from £3 5s. to £3 7s. 6d. and £3 10s. on trucks, Fremantle. However, hay for immediate delivery is very scarce, owing to interrupted communication, and the demand for hay on spot is firm at £3 15s. per ton.

Pressed Straw.—Consignments forward are very light, the demand fair. Ruling rates at Perth and Fremantle £2 per ton f.o.r.

Algerian Oats.—No locals offering. Our Melbourne office wired a further improvement in values of Victorian Algerians. We have to report good sales of crushed and whole Algerians, New Zealand, and Tasmanians for the goldfields and local trade at advanced rates.

KALGOORLIE.

Chaff.—We have to report that, at the time of writing, supplies in Kalgoorlie are absolutely bare, and there is a very eager demand for prime chaff. Our sales to-day and yesterday for prime, £5 5s. to £5 10s. per ton. The quantity sold, however, was necessarily very small. Owing to heavy rains in the agricultural districts values have risen to £5 5s. and £5 10s. per ton during the last week. This is because our farming friends have been unable to load trucks.

Closing rates are as follows:—

Prime chaff (exceedingly good demand) £5 10s. per ton.
Good qualities up to £5 per ton. (Good demand.)
Inferior to medium qualities up to about £4 10s. per ton. (Very fair sale.)

We are of opinion that the present good market is an opportune time for our farming friends to dispose of their chaff. With the prospects of an early harvest in the districts along the Goldfields railway, there must be heavy supplies during the latter part of September, if not sooner.

STOCK.

At our Beverley sale on Thursday, 28th ult., there was an excellent yarding, and the yards were cleared at satisfactory prices.

Fat sheep sold at 24s. 7d.
Ewes in lamb, 23s. 9d. to 24s. 7d.
Hogget ewes, 19s. 1d.
Fat lambs, 13s. 9d.
Porkers, 28s. 6d. to 52s. 6d.
Slips, 14s.
Breeding sows, £3 to £3 5s.
Fowls, 5s. 10d. to 6s. 2d. per pair.
Heavy draught horses, £40 to £47.
Medium draughts to £26.
Light harness horses, £4 10s. to £10.
Milch cows, to £10 15s.
Young steers to £4 5s.

At our Newcastle sale on Wednesday, 3rd inst., we sold :—

Hoggets at 16s. 6d.
Porkers realised up to £3.
Slips, 15s. 3d. to 17s.
Milch cows to £13.
Light horses at £10 10s. to £15.

HIDES, SKINS, TALLOW, ETC.

Messrs. Dalgety and Co., Limited, report having held their usual weekly sale on Friday, 5th August :—

Sheepskins.—A moderate offering was submitted to a good attendance of the trade. All woolled skins met with good competition at unchanged values, some of super quality selling to 7⅝d. per lb. Shorn pelts were neglected, prices offered showing a decline of ½d. per lb.

Super merino to full wool	—	to	7⅝d.
Good merino ¾ to full wool	6¾d.	,,	7¼d.
Medium ,, ,, ...	6d.	,,	6½d.
Good merino ¼ to ½ wool	6d.	,,	6½d.
Medium	5d.	,,	5½d.
Fine crossbred ¾ to full wool	6½d.	,,	7⅛d.
,, ,, ½ to full wool	5¾d.	,,	6¼d.
Medium ¾ to full wool	6d.	,,	6¼d.
Coarse	5¾d.	,,	6d.
Pelts	3½d.	,,	4½d.

In all cases where pelts of above are sun-dried, weevil-eaten, torn, or perished prices are from 1d. to 2d. below quotations. We notice in many consignments arriving at this season of the year that the skins are bundled before quite dry, which causes them to become sweated, and considerably depreciated in value, and would strongly recommend the necessity of special care being taken in this matter.

Hides.—There was a small supply, competition was dull, any change in values being in buyers' favour.

Heavies, special	— to $5\frac{1}{4}$d., nominal.
Heavies	$4\frac{1}{4}$d. „ $4\frac{1}{2}$d.
Medium and light	$4\frac{1}{8}$d. „ $4\frac{3}{8}$d.
Dry	$4\frac{1}{4}$d. „ $5\frac{1}{2}$d.
Damaged and cut	$3\frac{1}{2}$d. „ $4\frac{1}{4}$d.

Calfskins.—Sound and good conditioned ...	2s. 6d. each.
Cut and damaged	1s. 4d. to 2s. each.

Attention to flaying and preparation for market is very necessary, and results in enhanced values.

Kangaroo and Furred Skins:—Some nice lines of Kangaroo skins met with good competition at unchanged values. No red skins were offered, and we quote these nominally.

	Blue Skins.	Red Skins.
$\frac{3}{4}$ to 1lb. average ...	2s. 6d. to 2s. 7d. ...	2s. to 2s. 5d., nominal.
$\frac{1}{2}$lb. average ...	1s. 6d. to 1s. 9d. ...	1s. 3d. to 1s. 6d.
$1\frac{1}{2}$lb. to 2lb. average	2s. to 2s. 6d. ...	1s. 10d. to 2s. 2d.
Damaged lines ...	1s. to 1s. 8d. ...	1s. to 1s. 6d.
Euro skins	1s. to 1s. 7d.	
Brush Kangaroo ...	1s. 2d.	

Opossum Skins.—There was a good supply, some nice lines being submitted, and values received admit of no alteration:—

Good greys and reds	5s. 6d. to 6s. 6d. per dozen, average.
Medium...	4s. 6d. to 5s. per dozen, average.
Blacks	16s. to 18s. per doz., average.

Tallow.—Moderate supplies to hand, the market showing no improvement on the lower values quoted last week:—

Prime (in casks)	21s. per cwt., nominal.
Medium, mixed (in casks)	18s. 6d. to 19s. per cwt.
„ (tins and oddments)	16s. to 17s. 6d. per cwt.

Horns, Hair, etc.—None forward, but a keen inquiry exists, and we quote nominally:—

Horns, large and fresh	35s. to 41s. per 100.
„ small and fresh	10s. to 12s. „
„ stale and perished, to ...	5s. per 100.
„ very small, to	1s. „
Rough bones, to	3s. 6d. per cwt.
Horse hair, to	1s. 3d. per lb.
Cowhair, to	6d. per lb.

GARDEN NOTES FOR SEPTEMBER.

By PERCY G. WICKEN.

This may be said to be one of the busiest months of the year in the vegetable garden, and being the spring month, most of the heavy rains will be over and the weather becoming warmer. The frosts will be almost over, the excess moisture will be draining off and the soil will be warmer, which will start into growth those plants already up, and cause the seeds planted during the month to germinate quickly and make rapid growth. The more tender and delicate plants may be planted out in the open without much risk, and seed beds may be made in the open for such plants as tomatoes, which it is not safe to plant while any danger of frost remains. Plants already raised in sheltered beds or under glass may be planted out, and work in the garden should be pushed along as rapidly as possible, so as the plants get a good start before the dry weather sets in. Break up and work all the ground you require as deeply as possible, so as to enable the ground to store up a good supply of moisture for the dry weather. The best results from the garden are obtained if the ground is trenched or subsoiled before sowing, but this does not necessarily mean to bring the sour subsoil to the surface. The surface can be first removed and the subsoil broken up, and the surface soil from the next bench placed on top of the piece just broken up. While breaking up the soil in this manner, stale manure can be dug in and well mixed with the soil, and in addition to the manurial properties, this will improve the mechanical condition by adding humus to the soil and cause it to become warmer and more porous. Liberal supplies of manure are necessary in the garden if good vegetables are expected, and failing a supply of farmyard manure, bonedust or boiling-down refuse should be dug into the ground and the more soluble manures applied as a top dressing later on in the season. The winter having been a mild one, we may expect the insect pests of the common types to be troublesome, and to check the attacks of caterpillars and other leaf-eating insects, the plants should be sprayed, as soon as the pests make their appearance, with a mixture of Paris green and water, in the proportion of 1oz. Paris green to 10 gallons of water. The Paris green should first be made into a paste the same as mustard and the water then added to it. This being an arsenical poison, care must be taken that it is not applied to garden produce within two or three weeks from the time it is fit for consumption.

ASPARAGUS.—Plants should by this time be in the ground as described last month, and if not already planted, they should be put out at once, as the crowns will probably have started to grow. The plants require well-drained ground.

ARTICHOKES (Jerusalem) should be planted out this month. They will do well in poor soil, and will prove valuable both as a vegetable and as a food for stock.

ARROWROOT.—The common arrowroot, *Canna Edulis*, will grow in most of the coastal districts. It is a hardy plant of the same tribe as the Cannas in the flower garden, and will supply a good quantity of bulbs, from which, by simply grating on a large nutmeg-grater and well washing, a supply of arrowroot for domestic use can be obtained. The true arrowroot, *Maranta Arundinacea*, is a small growing plant and not so likely to succeed as the *Canna Edulis*. Both varieties can be planted this month.

BEANS (French or Kidney) are a popular, useful, and easily-grown vegetable, and can be planted this month in almost all parts of this State, as danger from frost will be slight. The ground should be well worked, and manures such as bonedust and blood manure should not be applied, but phosphatic and potash manures will prove of benefit to this crop. They should be planted in rows about three feet apart, and the climbing varieties will require to be staked as soon as they begin to run.

BEET (Red).—A few rows of this vegetable should be sown to keep up a supply; the drills should be about 18 inches apart and the seed should be covered about one inch deep. The seed is slow to germinate, and it can be started by being placed between two damp bags before sowing.

BEET (Silver).—A good supply of this drought-resisting plant should be sown this month. The ground requires to be well manured with farmyard manure. The succulent leaves are very acceptable in the hot weather.

CABBAGE.—Plant out any young plants that you may have available in a bed well supplied with manure, and supply them with a quantity of liquid nitrogenous manure to force them along. Plant out a few more seeds in a seed bed.

CARROT.—Sow a few more rows. The ground should be dug deeply, but fresh manure should not be applied. Ground that has been manured for the previous crop is best for this plant.

CELERY.—Plant out all the forward plants you may have in well-manured trenches; those already growing should be kept earthed up, so as to cause them to bleach. In moist districts a little more seed may be sown.

CUCUMBER.—In the warmer districts seed may be sown in the open during the month, but in the cooler districts it is still risky. The hills for cucumbers should be thoroughly well dug up and manured, and from six to eight seeds sown on each hill. The hills should be from six to eight feet apart each way, according to the variety, and the space between the hills should be kept free from weeds until the plants take possession of the ground. If all the seeds come up those not required can be weeded out, as it is a mistake to grow too many plants in each hill; three to four plants in each is plenty.

LEEK.—A few seeds may be sown for future use, and those plants that are fit in the seed bed may be planted out, and any forward plants may be earthed up to cause them to bleach.

LETTICE.—Seeds should be sown in drills where they are intended to grow, and the young plants thinned out, as they are likely to run to seed if transplanted this time of the year.

ONIONS.—Plant out all healthy seedlings from the seed bed into ground that has previously been well prepared and manured; a few more seeds may be sown for future use.

MELONS.—Rock melons can be sown largely this month, as well as water and preserving melons. The hills shall be worked the same as for planting out trees in an orchard, and from six to eight seeds planted in each hill. The distance apart of the hills varies from 6ft. to 14ft. apart each way, according as to whether the plants are strong runners or not.

PEAS.—In the cooler districts a few more rows may be sown. The earlier-sown plants of the climbing varieties will require to be staked.

POTATOES.—If not already sown, a few rows of potatoes should be planted for home use. The land should be well manured, and good healthy seed obtained. In the cooler districts a crop can still be sown, but in dryer districts it is now late.

PUMPKINS should be treated in the same manner as melons, and should be planted as soon the frosts will permit. There are both bush and running varieties of pumpkins, as well as bush marrows and squashes, which can be grown close together, and are generally early maturing varieties. The earliest varieties to mature are the white bush marrow and the custard squash.

SWEET POTATOES.—The tubers placed in seed beds, as mentioned last month, should now be giving plenty of shoots, which should now be planted out in ridges in the field. The drills or ridges should be three feet apart and the shoots planted about eighteen inches apart in the drills.

TOMATOES.—In the warmer districts of the State those who pay special attention to this plant will have the bushes well forward and

perhaps in flower, but in most districts the young plants will only be fit for planting out, and in the colder districts the seed will hardly be up. As many plants as possible should be planted out as soon as available, as a liberal supply of this wholesome vegetable is always welcome.

FARM.—Those who have land available will no doubt be busy fallowing, but the bulk of new settlers have not sufficient land available to allow them to fallow. Now that the weather is becoming finer, as much burning-off and clearing as possible should be done before this work has to be stopped under the Bush Fires Act. Land should be prepared for sowing summer crops, and such crops as pumpkins, melons, mangles, sugar beets, maize, sorghum, Hungarian millet, buckwheat, sunflowers, and chicory can all be sown during this month. With a good manuring and a fairly moist season, most of these crops should have a good chance of success. They should all be planted in drills, with the exception of pumpkins and melons, so as to enable the cultivator to be kept constantly going between the rows, and thereby conserve the moisture. The pumpkins and melons should be planted in hills about twelve feet apart each way, and this will enable the cultivator and plough to work between the rows. A small area of land should also be prepared for sowing some of the summer leguminous crops next month. The cereal crops should, under favourable circumstances, be making good growth now; and a look round the harvesting machinery to see if any duplicates are wanted or any parts are needing repairs will be advisable, and may save much delay later on.

THE CLIMATE OF WESTERN AUSTRALIA DURING JULY, 1904.

This month's meteorology has been specially interesting, because it appears to have thrown fresh light upon the path of our winter storms prior to their arrival at Cape Leeuwin. Hitherto it has been generally supposed that the "lows" which sweep along the Southern Ocean from the Leeuwin to Tasmania had previously travelled Eastward from South African longitudes, and they have frequently been spoken of by both South African and Australian meteorologists as Northerly extensions of the normal low pressure which is supposed to exist in the Antarctic regions. Efforts to trace these storms from Africa to Australia have failed, and it will be seen, from the following extracts, that this month's observations give support to the theory that these winter disturbances are true

cyclones which travel down the Indian Ocean, and appear to be very similar to the summer storms, except that, as a general rule, the track of the winter cyclones is well to the Westward of our coast, and we do not perceive their approach until they are close to the Leeuwin. If this theory turn out, upon further investigation, to be correct, it will at times render valuable assistance to the forecaster, for indications of the approach of a storm from the ocean may frequently be obtained from North-West coastal reports, a direction whence indications have generally been overlooked. The following three extracts are from remarks communicated at the time to the daily Press :—

> 11th: "The present weather disturbance is of more than usual interest, as it is of the regular monsoonal type, though occurring in the midst of winter. As far back as the the 4th, heavy rains commenced to fall in the South-West districts, with a slight indication of a "low" out at sea. The unsettled weather slowly extended inland and Southwards, but only to meet a well-established "high," with fine, cold weather. The "low," still keeping well out to sea, moved steadily down the coast, and the weather gradually became overcast throughout the State as the "high" moved Eastward. Winds remained Easterly, and heavy rain continued in the North-West, with lighter showers and atmosphere surcharged with moisture throughout. Progress has continued, and very heavy rains fell yesterday between Perth and Geraldton. All this occurred with Easterly winds, but the "low," as was anticipated, is now rounding the Leeuwin, and will probably progress in future as an ordinary winter storm and travel Eastward. In accordance with this, winds are veering Westerly, and seas are commencing to rise on the South-West coast, whilst the weather has at last cleared in the North-West."

> 20th: "We have again a very interesting weather report. The conditions, this winter, differ considerably from those to which we have been accustomed ever since the Observatory was founded, and will probably throw some light upon the very difficult question of whence our winter storms come. Endeavours have been made from time to time to trace storms from Mauritius, Natal, or the Cape, to our own country; but there seems to be no connection, and the theory has been gradually forming that our winter, like our summer, storms come down the Indian Ocean from tropical regions. In the summer many have been traced, for their main track lies not far from our North-West and West coastline, and, in some cases, they are more Eastward than usual, and give destructive storms on the North-West coast, and afterwards travel overland, giving rain throughout the interior. Many of them, however, seem to keep well out to sea, but, roughly, parallel to the

coast, and eventually turn round the Leeuwin and run across the Bight to the South of Tasmania. After Easter, as a rule, we see nothing of this class of storm until the following Christmas. The ordinary winter storm, on the other hand, appears to approach the Leeuwin from well to the Westward, and used to be considered as coming across from the Cape. Since, however, all attempts to trace any connection between African or Mauritius weather and our own have failed, we seem to be forced to one of two conclusions—either the ordinary winter storms are born between Mauritius and Western Australia, or they come from the tropics just like the summer type, but keep much farther West in the Indian Ocean. The former hypothesis raise greater difficulties than the latter, and therefore the theory is gradually taking shape that there is only one class of storm which affects us the whole of the year round. It has its birth in tropical oceans, moves at first in a South-Westerly direction, which gradually veers South and then South-East, and finally East-South-East and East, forming a kind of parabolic curve. In summer its track lies close to our North-West and West coastal line, but in winter it is much farther out to sea, and, as a rule, we perceive it only when approaching the Leeuwin. The great interest of the present winter's weather is that several of the storms appear to bear out this view, for they are distinctly of the summer type, and their first approach has been signalised by heavy rains in the North-Western districts, which have extended Southward throughout the State, preceded, and even accompanied, by pronounced Easterly winds, though the rain-bearing clouds are moving from the North-West. To-day's reports would seem to indicate another of this type, for heavy rain has again fallen in the North-West, and the unsettled weather is extending down and inland towards the Murchison. It is also becoming unsettled along the West and South-West coast, and if the "high" which now covers our interior moves Eastward, as seems likely, we shall probably have unsettled weather throughout the State shortly."

31st: "The present weather disturbance is once again a very interesting one, as it gives such decided evidence of having come down the Indian Ocean from the North or North-West.

"Its effect was first noticeable in this State on Thursday last (28th). The weather on that day at 9 a.m. was fine throughout the State and mostly clear, but it was cloudy to overcast on the North-West coast, between Sharks Bay and Cossack, and the isobars indicated, though but feebly, the existence of a "low" somewhere off the North-West coast. During the next 24 hours these clouds extended Southward and Eastward, and covered nearly the entire State South of

the tropics, and rain had commenced to fall in the neighbourhood of Sharks Bay, whilst the presence of a "low" off the West coast, working South, was more clearly evidenced.

"Rain, as anticipated, followed the clouds, and before long it was raining throughout, being very heavy in the neighbourhood of Sharks Bay. The "low" travelled slowly down the coast, and it is only now commencing to make easting along the South coast.

"Meanwhile steady rain was general, and this morning's report shows that nearly the entire State has been favoured with a magnificent downpour, the greatest quantity recorded for the 48 hours being 488 points at Jarrahdale. It is still raining or showery in South-West districts, with rough seas, but appears to have moderated from Perth Northward."

Taking the climate of the State as a whole, we find that the pressure was generally below normal, especially in North-West districts. The day temperature also was below normal, but the night temperature was higher than usual, both these variations being particularly noticeable in the North-West.

The rainfall was, as usual, *nil* in the East Kimberley district, but throughout the North-West and interior it was remarkably heavy; in fact, the heaviest on record for July in the former district. In West and South-West coastal districts, it was about normal, but would be excessive if the very heavy fall of the 31st (registered on August 1st) were included.

It was not, on the whole, a frosty month, but the temperature of the surface of the ground was below 32° on several nights, the lowest reading being 20·0 at Wandering on the 14th. The following table shows the mean and absolute minimum recorded by a minimum thermometer placed on the soil.

Station.	Mean.	Lowest.	Date.
Peak Hill	42·4 ...	32·8 ...	22
Cue	40·4 ...	28·1 ...	19
Coolgardie	36·3 ...	23·5 ...	28
Southern Cross	38·7 ...	28·0 ...	28
Walbing	33·8 ...	23·2 ...	22
York	37·6 ...	29·0 ...	27, 28
Perth	43·0 ...	32·8 ...	14
Wandering	28·5 ...	20·0 ...	14
Narrogin	36·6 ...	26·9 ...	7
Bridgetown	35·2 ...	25·0 ...	8, 10
Karridale	39·8 ...	25·5 ...	8
Katanning	34·9 ...	23·0 ...	28

The Climate of Western Australia during July, 1904.

	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. July, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	30·022	30·033	30·179	29·902	84·9	65·1	75·0	94·0	57·6	85·0	64·9	94·8	50·0	...	2917
	Derby	30·010	30·036	30·155	29·909	86·4	60·5	73·4	92·8	51·0	84·6	57·0	94·0	42·0	...	3182
	Broome ...	30·003	30·038	30·142	29·852	82·3	62·7	72·5	88·2	55·5	81·1	57·1	92·5	40·2	232	2353
	Condon ...	30·034	30·090	30·158	29·924	73·7	58·9	66·3	82·1	51·6	76·6	48·2	88·8	38·0	238	561
	Cossack ...	30·038	30·104	30·181	29·884	74·7	59·3	67·0	82·0	51·0	74·9	54·2	85·0	43·7	402	1138
	Onslow ...	30·035	30·096	30·190	29·900	71·0	55·0	63·0	78·0	43·0	76·0	51·9	88·0	41·0	899	1532
	Carnarvon ...	30·058	30·132	30·279	29·882	69·1	50·6	59·8	81·0	41·0	71·6	49·6	81·7	40·5	593	1001
	Hamelin Pool...	30·081	30·144	30·350	29·918	66·0	49·0	57·5	74·8	35·8	68·9	47·8	77·2	36·6	522	864
	Geraldton ...	30·091	30·161	30·357	29·746	67·6	50·3	59·0	75·0	43·5	68·7	49·7	81·0	39·4	412	1084
Inland:	Hall's Creek *	30·122	30·112	30·285	29·910	80·4	50·7	65·6	89·7	41·0	77·9	47·4	92·0	35·0	...	2791
	Marble Bar* ...	...	...	...	...	74·5	56·1	65·3	84·5	50·0	78·1	51·2	87·0	38·0	404	1024
	Nullagine * ...	30·090	30·142	30·244	29·865	70·3	50·8	60·6	81·5	40·2	72·0	43·7	82·0	28·9	256	709
	Peak Hill ...	30·134	30·188	30·345	29·865	59·5	45·8	52·6	70·4	38·8	64·2	43·6	78·3	34·0	445	751
	Wiluna ...	30·151	30·208	30·354	29·829	59·5	42·8	51·2	69·0	33·0	64·0	38·6	77·4	28·9	358	707
	Cue	30·121	30·194	30·362	29·809	60·4	42·7	51·6	67·0	33·1	65·6	44·1	78·2	33·2	539	766
	Yalgoo ...	30·093	30·180	30·369	29·761	61·8	42·6	52·2	73·5	32·0	64·6	42·1	78·0	30·7	210	524
	Lawlers ...	30·158	30·204	30·388	29·770	60·1	41·6	50·8	69·0	32·2	62·8	41·3	78·0	31·4	316	663
	Laverton* ...	30·170	30·234	30·401	29·734	58·6	41·4	50·0	66·5	30·5	62·0	39·1	69·1	29·0	192	671
	Menzies ...	30·173	30·202	30·431	29·816	59·5	41·4	50·4	68·1	31·0	61·7	41·8	77·0	32·0	215	490
	Kanowna ...	...	...	...	...	58·3	39·3	48·8	67·0	31·0	58·7	40·5	65·6	35·3	173	451
	Kalgoorlie ...	30·167	30·195	30·418	29·730	59·2	42·5	50·8	66·9	32·3	61·5	42·4	76·2	31·7	208	541
	Coolgardie ...	30·158	30·184	30·432	29·741	58·3	41·8	50·0	67·2	32·0	61·1	41·5	75·0	31·9	190	630
	Southern Cross	30·140	30·173	30·459	29·706	59·7	39·1	49·4	66·2	29·8	61·9	38·7	79·0	27·0	262	934
	Walebing ...	...	...	...	...	60·3	39·2	49·8	69·0	30·0	59·1	40·1	69·0	28·2	537	1475
	Northam ...	...	...	...	...	60·9	38·9	49·9	70·0	32·0	60·9	40·4	68·4	30·2	408	1563
	York	30·115	30·165	30·446	29·630	60·2	39·8	50·0	68·0	31·0	62·3	40·6	71·2	27·0	385	1409
	Guildford* ...	...	...	...	...	62·3	44·4	53·4	70·2	30·8	62·9	42·6	72·2	31·5	609	2253

* Averages for three years only.

The Climate of Western Australia during July, 1904—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. July, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:															
Perth Gardens ...	30·082	30·147	30·405	29·627	61·7	47·3	54·5	69·0	38·8	63·3	45·9	75·2	33·0	608	2149
Perth Observatory	30·112	30·164	30·417	29·558	61·4	47·1	54·2	69·5	37·8	62·9	47·6	73·8	38·1	603	2144
Fremantle ...	30·103	30·132	30·415	29·530	61·5	49·7	55·6	67·5	41·0	62·8	50·4	72·2	37·0	525	2068
Rottnest ...	30·090	30·119	30·394	29·495	61·0	52·2	56·6	67·4	48·2	62·2	52·9	72·5	38·0	663	1763
Mandurah* ...	...	...	...	...	61·0	44·9	53·0	66·1	33·0	62·3	44·6	68·4	31·3	845	2365
Wandering ...	...	...	...	...	66·3	43·7	55·0	69·0	33·0	57·0	38·4	64·9	27·8	416	1852
Narrogin... ...	...	...	...	...	55·0	41·4	48·2	62·8	30·8	...	...	...	...	431	1419
Collie*	...	...	...	...	58·4	36·8	47·6	65·6	29·5	59·0	35·8	68·0	26·9	495	2168
Donnybrook ...	...	...	...	...	60·1	41·7	50·9	66·3	30·2	60·2	40·8	65·7	30·6	445	2246
Bunbury ...	30·068	30·132	30·412	29·520	61·5	46·1	53·8	67·0	38·0	62·9	46·5	73·0	32·0	611	2419
Busselton* ...	...	...	...	...	60·7	43·3	52·0	65·0	35·0	60·6	43·8	66·5	32·5	408	2031
Cape Naturaliste	30·094	...	30·418	29·520	59·0	49·2	54·1	65·2	42·5	...	...	...	...	378	1979
Bridgetown* ...	...	...	...	...	59·2	37·3	48·2	66·0	27·0	59·1	37·7	68·3	25·9	464	1875
Karridale ...	30·074	30·109	30·400	29·503	62·0	44·6	53·3	68·0	30·5	61·0	46·7	70·8	30·8	599	2689
Cape Leeuwin ...	30·042	30·056	30·409	29·360	61·8	51·7	56·8	67·0	46·4	61·2	52·5	70·6	43·0	579	2361
Katanning ...	30·095	30·136	30·416	29·532	57·3	41·1	49·2	65·0	31·0	58·5	40·0	68·2	27·0	283	1092
Albany	30·069	30·087	30·435	29·497	60·1	43·8	52·0	68·0	35·0	61·0	44·6	73·5	30·0	822	2788
Breaksea... ...	30·084	30·073	30·426	29·430	57·7	49·5	53·6	66·8	45·8	59·5	49·3	71·8	40·0	625	2159
Esperance ...	30·100	30·130	30·400	29·590	60·0	43·0	51·5	65·0	35·0	62·7	45·1	77·6	31·0	660	1840
Balladonia ...	30·187	30·185	30·478	29·670	59·0	39·7	49·4	65·4	31·0	61·0	39·2	76·5	26·2	95	552
Eyre*	30·156	30·168	30·431	29·607	61·5	41·8	51·6	70·2	28·0	61·7	41·6	78·1	27·2	112	949
INTER-STATE.															
Perth	30·112	30·164	30·417	29·558	61·4	47·1	54·2	69·5	37·8	62·9	47·6	73·8	38·1	603	2144
Adelaide	30·230	30·168	30·641	29·532	58·1	44·8	52·0	62·6	36·9	58·7	44·3	72·5	32·7	273	...
Melbourne	30·186	30·025	30·577	29·375	55·7	42·8	49·2	64·4	31·5	55·5	41·4	68·4	27·0	157	...
Sydney	30·160	30·116	30·490	29·680	58·0	48·0	53·0	68·0	41·0	58·9	46·1	74·9	35·9	1106	3994
Cocos Island ...	30·010	...	...	...	...	...	...	81·9	70·0	...	...	...	...	491	...

* Averages for three years only.

The Observatory, Perth, August, 1904.

W. E. COOKE, Government Astronomer.

RAINFALL for June, 1904 (completed as far as possible), and for July, 1904 (principally from Telegraphic Reports).

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham ...	13	2	Nil	...
6-Mile	19	2	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	..
Denham	...	...	...	...
Rosewood Downs	22	1	...	...
Argyle Downs ...	75	2	...	...
Lisadell	...	...	...	...
Turkey Creek ...	139	3	Nil	...
Hall's Creek ...	80	5	Ni	...
Nicholson Plains	...	...	...	...
Flora Valley ...	79	2	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	138	3	...	...
Beagle Bay ...	44	1	...	...
Derby	62	2	Nil	...
Yeeda	...	...	...	...
Liveringa ...	52	2	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	117	3	...	...
Fitzroy Crossing	92	4	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	59	3	...	...
Broome	14	1	232	2
Roebuck Downs	...	...	...	...
Thangoo	15	1	...	...
La Grange Bay...	193	5	191	5

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
North-West:				
Wallal	73	3	332	9
Condon	86	3	238	7
Pardoo	169	3	...	...
DeGrey River ...	98	5	...	...
Port Hedland ...	140	4	384	10
Boodarie ...	174	4	...	...
Warralong ...	132	4	...	...
Muccan	189	5	...	...
Ettrick	110	4	...	...
Mulgie	99	4	...	...
Eel Creek ...	113	4	...	...
Station Peak ...	95	7	408	9
Coongon... ...	111	4	...	...
Warrawagine ...	108	4	...	...
Bamboo Creek ...	89	6	326	7
Marble Bar ...	81	5	404	11
Warrawoona ...	65	4	442	7
Corunna Downs...	72	4	...	...
Nullagine ...	43	4	256	7
Mt. Edgar ...	111	4	...	...
Kerdiadary ...	...	...	...	...
Roy Hill... ...	45	2	...	...
Middle Creek ...	31	3	...	...
Mosquito Creek	59	5	...	...
Mulga Downs ...	...	...	...	...
Woodstock ...	38	4	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	32	4	...	...
Millstream ...	22	2	...	...
Yandyarra ...	37	2	...	...
Mallina	98	6	...	...
Whim Creek ...	95	7	501	11
Cooyapooya ...	112	4	...	...
Woodbrooke ...	241	6	...	...
Croydon	148	6	...	...

RAINFALL—*continued.*

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
NORTH-WEST—*cont.*				
Balla Balla ...	100	4	...	...
Roebourne ...	198	6	432	7
Cossack	342	7	402	12
Fortescue ...	108	4	707	9
Mardie	75	4	...	...
Mt. Stewart ...	107	4	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	151	2	...	...
Onslow	155	5	836	9
Peedamullah ...	164	7	...	...
Red Hill	158	2	...	...
Mt. Mortimer ...	99	3	...	...
Peake Station ...	136	4	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	98	2	...	...
Yanrey	77	4	...	...
Point Cloates ...	157	5	...	...
GASCOYNE:				
Winning Pool ...	140	6	938	9
Coordalia ...	145	5	...	...
Towara	85	5	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	127	5	...	...
Gifford Creek ...	68	2	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	82	5	...	...
Yanyeareddy ...	121	5	...	...
Williambury ...	82	7	...	...
Booloogooroo ...	46	2	736	8
Wandagee ...	94	4	...	..
Minilya	109	6	...	...
Bernier Island ...	157	9	1093	11
Boolathana ...	157	7	...	...
Carnarvon ...	205	7	593	10
Brick House ...	123	6	673	11
Cooralya	...	...	...	...
Doorawarrah ...	73	5	...	...
Bintholya ...	83	5	...	...
Mungarra ...	53	3	...	...
Clifton Downs ...	...	...	...	..
Dairy Creek ...	100	2	...	...
Upper Clifton Downs	76	5	...	...

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
GASCOYNE—*contd.*				
Errivilla	...	...	...	...
Dirk Hartog Island	294	13	..	..
Sharks Bay ...	158	12	430	11
Kararang ...	...	...	...	...
Meedo	...	...	...	...
Tamala	347	13	...	...
Wooramel ...	208	7	638	12
Hamelin Pool ...	81	11	522	9
Byro	55	4	...	...
Yarra Yarra ...	105	5	...	...
Berringarra ...	33	2	...	...
Mt. Gould ...	27	3	...	...
Moorarie ...	27	3	...	...
Wandary... ...	25	1	...	...
Peak Hill ...	31	5	445	11
Horseshoe ...	32	5	463	12
Mt. Fraser ...	59	2	...	...
Abbotts	60	3	383	9
Belele	...	...	...	...
Mileura	74	5	...	...
Milly Milly ...	33	5	320	6
Manfred ...	45	5	...	...
New Forest ...	152	13	347	7
Woogorong ...	104	7	...	...
Boolardy ...	73	4	...	...
Twin Peaks ...	...	...	...	...
Billabalong ...	86	4	...	...
Wooleane ...	77	6	...	...
Murgoo	102	6	363	8
Yallalonga ...	...	...	...	...
Meka	101	4	272	6
Mt. Wittenoom ...	118	6	...	...
Nannine	67	4	412	7
Star of the East...	55	3	402	7
Annean	49	4	418	8
Coodardy ...	45	2	500	11
Cue	62	3	539	9
Day Dawn ...	59	3	481	8
Lake Austin ...	69	3	344	6
Lennonville ...	81	8	219	8
Mt. Magnet ...	78	7	234	8
Warracoothara ...	...	...	...	...
Challa	53	6	226	7
Youeragabbie ...	66	5	130	7
Murrum	72	5	174	5
Burnerbinmah ...	85	12	181	8

RAINFALL—*continued.*

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Barnong	235	11	...	...
Mellenbye ...	183	12	360	9
Yalgoo	111	10	210	9
Wagga Wagga ...	100	7	190	6
Gabyon	178	8	...	...
Wurarga ..	...	...	...	...
Muralgarra ...	126	10	178	5
South-West Division (Northern Part):				
Murchison House	308	14	...	...
Mt. View ...	270	13	377	10
Mumby	481	16	335	13
Yuin	82	8	312	7
Northampton ...	548	14	282	12
Oakabella ...	488	15	278	12
Narra Tarra ...	477	11	...	...
Tibradden ...	548	14	344	8
Myaree	427	15	315	13
Sand Springs ...	498	11	347	12
Mullewa... ...	323	14	338	9
Kockatea ...	350	12	...	...
Bootenal ...	336	7	...	...
Geraldton ...	371	14	412	13
Greenough ...	273	11	361	10
Bokara	518	11	440	13
Dongara ...	325	12	361	8
Dongara (Pearse)	325	12	349	10
Strawberry ...	488	13	356	13
Nangetty ...	356	11	233	12
Mingenew ...	412	16	276	13
Urella	383	11	250	6
Yandenooka ...	488	13	333	11
Rothesay ...	295	10	...	...
Field's Find ...	139	12	232	9
Carnamah ...	392	13	232	12
Watheroo ...	572	16	400	14
Dandaragan ...	564	16	352	15
Moora	508	16	511	14
Yatheroo ...	673	16	593	10
Walebing ...	499	16	537	13
New Norcia ...	516	17	433	12

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	874	17	636	13
Belvoir	765	19	608	11
Mundaring ...	1,095	19	733	15
Wandu	646	18	696	17
Guildford ...	767	20	609	12
Kalbyamba ...	...	...	...	...
Canning W't'r'w'ks	950	16	744	13
Perth Gardens ...	785	19	608	14
Perth Observatory	770	19	603	17
Subiaco	742	19	545	15
Fremantle ...	847	19	525	16
Rottnest... ...	558	19	663	19
Armadale ...	1,054	15	596	11
Rockingham ...	861	19	799	18
Jarrahdale ...	1,820	18	1,164	15
Mandurah ...	664	12	845	16
Pinjarra	978	19	769	16
Yarloop	1,094	19	718	17
Harvey	1,260	17	690	17
Upper Murray ...	1,077	19	872	17
South-West, Central Part (Inland):				
Hatherley ...	380	11	438	11
Dowerin ...	360	13	453	10
Momberkine ...	435	9	249	6
Monglin ...	499	14	444	10
Newcastle ...	815	16	375	11
Eumalga ...	767	17	404	12
Northam ...	592	16	408	11
Grass Valley ...	528	...	383	9
Meckering ...	430	15	403	11
Cunderdin ...	436	11	416	8
Codg-Codgin ...	249	13	367	9
Yarragin ...	279	11	204	5
Doongin... ...	301	13	356	8
Cuttenning ...	256	14	445	10
Whitehaven ...	457	...	548	12
Sunset Hills ...	445	13	403	12
Cobham	525	19	407	17

RAINFALL—*continued.*

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.	Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
SOUTH-WEST, CENTRAL—*contd.*					SOUTH-WEST—*continued.*				
Yenelin	378	12	412	10	Mordalup ...	451	18	314	18
Mt. Caroline ...	...	...	358	9	Deeside	601	21	431	17
York	512	23	385	19	Riverside ...	695	20	392	16
Dalebridge ...	431	12	384	11	Balbarup ...	718	13	452	13
Beverley ...	517	14	360	13	Wilgarup ...	594	19	460	18
Bally Bally ...	494	16	441	15	Bridgetown ...	555	23	464	18
Barrington ...	472	15	313	12	Westbourne ...	446	21	360	23
Stock Hill ...	516	14	423	10	Hillton	543	13	...	...
Sunning Hill ...	610	16	465	12	Greenbushes ...	649	16	306	12
Brookton ...	534	14	410	13	Greenfields ...	549	19	357	21
Wandering ...	827	13	416	13	Glenorchy ...	507	10	...	...
Glen Ern ...	713	18	444	12	Williams ...	565	17	361	12
Pingelly ...	626	12	407	10	Arthur	478	17	340	12
Marradong ...	961	18	544	13	Darkan	583	13	436	11
Bannister ...	1,008	16	566	13	Wagin	363	15	330	17
Narrogin ...	464	19	402	20	Glencove ...	307	18	260	15
Narrogin Experimental Farm	520	19	...	...	Dyliabing ...	253	16	...	...
					Katanning ...	269	19	283	13
Wickepin ...	517	13	434	12	Kojonup ...	520	18	478	17
Gillimanning ...	499	13	...	...	Broomehill ...	315	14	289	17
Bunking ...	316	17	351	10	Sunnyside ...	321	18	335	20
Bullock Hills ...	245	11	300	13	Woodyarrup ...	291	14	303	14
					Mianellup ...	220	15	290	16
					Cranbrook ...	280	11	314	13
SOUTH-WEST DIVISION (SOUTHERN PART):					Toolbrunup ...	311	17	330	14
					Tambellup ...	308	15	302	14
					Blackwattle ...	266	11	253	9
					Woogenellup ...	344	18	382	15
Bunbury ...	797	15	611	14	Mt. Barker ...	394	17	459	17
Collie	780	22	495	17	Kendenup ...	375	15	389	15
Glen Mervyn ...	685	13	389	15	St. Werburgh's...	366	15	...	...
Dardanup ...	...	...	...	...	Forest Hill ...	460	17	535	18
Donnybrook ...	701	18	445	15	Denmark ...	693	14	927	19
Boyanup ...	743	15	517	18	Grasmere ...	640	17	797	21
Ferndale ...	669	17	403	17	Albany	617	19	822	21
Busselton ...	718	18	408	19	King River ...	518	12	683	16
Quindalup ...	880	18	588	18	Point King ...	645	13	797	19
Cape Naturaliste	715	17	378	19	Breaksea ...	368	20	625	23
Lower Blackwood	755	19	345	11	Wattle Hill ...	...	...	...	...
Karridale ...	995	23	599	21	Cape Riche ...	264	9	...	...
Cape Leeuwin ...	715	22	570	22	Cherilulup ...	260	14	264	15
Biddellia ...	830	17	...	...	Pallinup ...	247	15	260	12
The Warren ...	1,055	20	737	18	Bremer Bay ...	336	11	493	18
Lake Muir ...	511	18	382	19	Peppermint Grove	...	20	578	20
The Peninsula ...	549	20	382	26	Jarramongup ...	232	11	286	10

RAINFALL—*continued.*

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
Eastern Division:				
Dural	...	...	...	...
Wiluna	29	4	358	12
Gum Creek ...	45	2	360	6
Mt. Sir Samuel ...	30	3	342	8
Lawlers	68	7	316	9
Leinster G.M. ...	46	3	384	9
Darda	43	5	265	11
Lake Darlôt ...	30	4	...	...
Mt. Leonora ...	95	5	151	6
Mt. Malcolm ...	78	5	101	6
Mt. Morgans ...	77	5	171	8
Burtville ...	65	3	183	5
Laverton ...	103	6	192	8
Murrin Murrin ...	90	5	113	5
Yundamindera ..	138	5	86	5
Tampa	69	3	59	1
Kookynie ...	88	6	71	5
Niagara	82	4	108	6
Yerilla	88	5	75	3
Edjudina ...	107	5	79	3
Menzies	135	6	215	6
Mulline	61	7	227	7
Waverley ...	82	9	174	5
Goongarrie ...	109	8	192	7
Mulwarrie ...	101	5	257	6
Bardoc	79	4	190	4
Broad Arrow ...	99	7	218	5
Kurnalpi ...	148	6	92	5
Bulong	132	7	165	5
Kanowna ...	132	11	173	5
Kalgoorlie ...	94	7	208	6
Coolgardie ...	140	12	190	8
Burbanks ...	161	7	226	6
Woolubar ...	120	5	200	4
Widgiemooltha ...	120	11	199	6
50-Mile Tank ...	186	8	201	7
Waterdale ...	137	8	148	8
Norseman ...	185	10	205	7
Lake View ...	166	13	243	10
Bulla Bulling ...	156	13	260	8
Woolgangie ...	...	...	...	...
Boondi	212	11	209	12
Eastern—*contd.*				
Boorabbin ...	236	13	208	9
Koorarawalyee ...	241	12	204	6
Karalee	229	7	229	7
Yellowdine ...	171	...	201	7
Southern Cross ...	262	10	262	8
Parker's Range ...	244	14	255	13
Parker's Road ...	251	9	...	...
Mt. Jackson ...	186	8	154	16
Bodallin ...	259	11	313	8
Burracoppin ...	225	10	369	7
Kellerberrin ...	310	11	352	10
Merredin ...	220	7	331	5
Nangeenan ...	279	9	337	8
Mangowine ...	264	14	429	12
Wattoning ...	250	9	252	7
Noonjarin ...	...	...	287	7
Eucla Division:				
Ravensthorpe ...	175	14	196	17
Coconarup ...	178	13	150	14
Hopetoun ...	391	12	314	13
Fanny's Cove ...	215	7	637	13
Park Farm ...	237	10	547	18
Esperance ...	427	13	660	17
Gibson's Soak ...	314	13	364	16
30-Mile Condenser	239	12	296	15
Swan Lagoon ...	230	12	278	12
Grass Patch ...	238	14	200	11
Myrup	344	14	496	17
Lynburn ...	300	12	...	...
Boyatup	365	13	...	...
Point Malcolm ...	285	16	...	...
Israelite Bay ...	178	12	130	12
Balbinia	189	10	...	...
Frazer Range ...	234	12	180	5
Balladonia ...	131	8	95	7
Southern Hills ...	...	...	...	...
Eyre	252	14	112	9
Eucla	162	15	91	9

The Observatory, Perth,
10th August, 1904.

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Government Astronomer.

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NOTES.

SHOW FIXTURES.—Secretaries of Societies are requested to send in to the Director the dates on which they intend holding their annual shows, for publication in the *Journal*.

PUBLICATIONS RECEIVED.—Amongst the many publications received during the month special attention is directed to the one from the Imperial Institute, London, being Vol. I. of "Bulletin of the Imperial Institute." It contains many very valuable articles on the cultivation of tropical and sub-tropical plants, all of which could be cultivated in some parts of this State.

A LARGE FARM AUTOMOBILE.—Another "largest automobile in the world" is a harvester in Southern California. The machine is 60ft. long and 30ft. wide. The motive power is furnished by oil. Eight men are required to run it. As the machine starts off, the grain begins to fall into sacks on the opposite side from where it is cut, and the straw drops into a cart behind.

COTTON GROWING.—In order to encourage cotton-growing on Government land in Zululand, the Government of Natal is offering land in lots of 1,000 acres, for two years, at an annual rental of ½d. per acre, with the right of renewal for 97 years at 6d. per acre. There are parts of this State where cotton may be grown quite

easily. It has been cultivated as far south as Hamel, on the South-Western line. Shipments of the bolls grown there are exhibited in the museum of the Department of Agriculture. An article dealing with its culture is published in this issue.

PRESERVING A SADDLE.—The best thing for removing stains from a saddle is a little oxalic acid dissolved in warm water, and applied with a sponge. Bushmen usually stain their saddles with bullock's blood, which also preserves the leather. If you want the saddle to have a yellow appearance, wash it with cold water and soft soap until free from dirt; then infuse some hay saffron in water, and rub it well into the leather; then apply soft soap on a woollen cloth, and finish up with a woollen rag on which beeswax has been rubbed.

CROP STATISTICS.—In this issue will be found the statistics, just completed, of the estimated area under wheat and oats. The total area laid down to wheat is 250,956 acres, as against 216,004 acres for last season, showing an increase of 34,951 acres. With respect to oats, for some reason this crop has not received the same amount of attention this year as last, for we find that, while 40,727 acres are under crop, yet last season 43,659 acres were planted, this shows a decrease for the present season of 2,932 acres; but taking the two crops together, we find that an additional 32,019 acres have been planted, which, if intended for grain, and taking 12 bushels to the acre as an average, which is nearly two bushels less than the average for last year, we should have an increase of 384,228 bushels.

MERITS OF CALIMYRNA FIGS.—Professor L. O. Howard, of the Department of Agriculture at Washington, has the following to say regarding the superiority of the Smyrna fig grown in California, a product of which we may feel justly proud. He says: "It stands in the same relation to other varieties of figs as the Washington Navel orange stands to ordinary varieties of oranges, and its superiority as a dried product over all other varieties which develop without caprification can no longer be questioned. It seems very probable that in the near future importations of figs will be practically stopped, as our whole country will be supplied with home-grown dried figs. But this feature by no means comprises all the possibilities of the industry. America will compete with the Mediterranean countries in the markets of the world. At present there are by no means enough trees growing in California to bring about this result, but the right variety will be planted by the thousands during the coming year, and in four or five years will produce substantial crops."

EVIL EFFECTS OF PRESERVATIVES.—The influence of boric acid and borax on digestion and health is summarised in a recent bulletin issued by the Bureau of Chemistry at Washington. It will be remembered that Professor Wiley instituted a series of experiments in which food containing different amounts of borax was *given to a number of young men selected for this purpose.* This experiment was instituted by the secretary of Agriculture to show just how far food preservatives could be used without detriment to general health. Eliminating all technicalities and summarising the results of this test, the following is a fair statement:—While many of the individual data obtained are contradictory, the general results of the investigation show in a convincing way that even in doses not exceeding one-half dram ($7\frac{1}{2}$ grains) a day, boric acid is prejudicial when consumed for a long time. It is undoubtedly true that no appreciable effects may be produced in persons of good health by the occasional use of preservatives of this kind in small quantities, but the young, the debilitated, and the sick must not be forgotten, and a safe rule to follow is to exclude these preservatives from foods intended for general consumption. This conclusion is certainly a sweeping one, and will affect the packing industry of America should the United States Department of Agriculture formulate rules and regulations based on this investigation.

HOW TO CURE RABBIT SKINS.—As it is likely that we shall have the professional rabbit-trapper here soon, a hint as to the best way to cure the skins should be of value. Among the trappers there may be those who have never had an opportunity of reading just how a rabbit skin should be treated, and this, no doubt, explains the dreadful condition of some of the lots now placed on the market. In the first place, the animal should be skinned while the body is still warm, no meat allowed to remain on the pelt, and the skin placed across a board or wire sleeve, stretched from belly to back, not overstretched, for this tends to make the fur thin. They should then be thoroughly dried, and, when this state has been attained, should be packed carefully into bags or bales, a little naphthaline being sprinkled among them to keep them free from weevil. The correct way is to pack in three lots, first bucks, then does, and lastly kittens. Summer skins should not be mixed with winter furs, for the buyer is apt to place low value on consignments of mixed lots. If the skins were got up in this manner, the buyer would have no doubt as to quality, etc., and very much larger prices would be the result. It is putting money into the hands of all who deal in them—the trapper, whose returns will be increased twofold; the buyer, who gets a reliable article and ships same abroad; and excites a demand for a really good product. Instead of regarding the rabbit solely as a pest, he might become very useful and profitable if these few hints were carried out.

PRUNING CITRUS TREES.

By A. DESPEISSIS.

The cultivation of oranges and lemons appeals to many, on account of the idea which is generally entertained that they do not need pruning. Although, on the one hand, these plants may be more fastidious as regards quality of soil or locality, yet, to those who look for a maximum of fruit production at the cost of a minimum of trouble, citrus trees are regarded with favour.

There is, no doubt, truth in the fact that an orange or a lemon tree, once planted, often do without shaping or pruning of any kind, yield crops proportionate to the vigour of their growth, and for the first few years carry fruit of as fine a quality as other trees which have been shaped and pruned by experienced hands.

As the tree grows in size and becomes older, the fruit crop shows a somewhat striking irregularity. Some of the oranges, which are carried on thin and spindly growths, are undersized, pale, and lack in flavour, whilst others, which hang on the rank upright growths which, forcing their way through the tree, emerge above it, are coarse and puffy, with plenty of rag and a thick rind.

Of really prime fruit the proportion becomes yearly a diminishing quantity. As that class of fruit is the most profitable to grow, every effort should be directed to secure as large a return of them as can reasonably be expected. To obtain that end, thorough cultivation, liberal manuring, irrigation wherever required should be assisted by proper pruning. As oranges require different styles of pruning to lemons, the methods will be referred to separately.

PRUNING THE ORANGE.

This season has probably seen more orange trees planted in Western Australia than has been the case before, and the resources of nurserymen have been taxed beyond expectation. Consequent upon the booking of heavy orders, it was sought to reduce the demand by raising the prices of trees from £7 10s. to £8 10s. and £9 10s. per hundred. At that price all available local trees were sold, as well as important consignments from the Eastern States, and a large shipment of Washington navel trees from California. Indeed, for novelties, 7s. 6d. each tree is obtained. Of the tens of thousands of newly-planted trees, however, it is unfortunately true that not a few fail to properly establish themselves and grow into profitable trees on account of lack of pruning, or no pruning at all, when first planted. Many others besides grow lop-sided and unsymmetrical which, were a little care taken in their early training, should grow into sturdy and fruitful trees.

If young trees come from a local nursery and the roots have been balled up in earth, little cutting back will be required, but if the roots have been more or less injured, or are dry, it will be advisable to cut back more severely. The tree is best headed back to a height of two feet or so, and the head, instead of being bunched near the top, is best formed on a single stem from a few well-placed laterals, three only by preference, growing symmetrically around the stump at an interval of two or three inches from each other. Branches will thus be better knit to the stem, and won't split when the trees begin to bear heavily. The object aimed at is to train a low-headed, stocky tree, with a short stem and a globular head, which shelters alike the stem, the main limbs, and the superficial roots of the tree.

The orange is naturally one which assumes a more globular and symmetrical shape than most fruit trees are wont to. For that reason more than for anything else perhaps they are often left untouched. Many consider they have done all that is required when they have shortened such top and side growths as shoot away from the tree in search of air and light. If an examination is made of a good sized orange tree that has been allowed to grow without artificial training, it is seen that a good deal of dead twigs and branches occur inside the head of the tree. They have been smothered by the thick growth around them. For some time already they had failed to blossom or to carry fruit, and after proving a burden to the tree and an obstruction to the branches around, they have died out. Dead branches take less room than live ones, and are less cumbersome; it is often nature's way of ridding the plant of unnecessary growth. That being so, is it not better to anticipate that effort of nature to discard useless growth and remove it before it has had time to impair the productiveness of the branches around? Other growths as well occur, which, starting as rank water shoots, grow straight upright through the foliage over which they top, and there expand and form a higher storey, which overshadows the one below, and by diverting the current of sap into newer channels, rob the lower branches of that fluid which maintains growth and stimulates fruitfulness. These shoots, as well as the twigs mentioned above, should be removed as soon as discovered. When young and tender they easily rub off; when older and fibrous they require cutting off with the secateur or the saw. By periodically overhauling your orange trees, after the fruit has been clipped off and before the blossoming has commenced, it is easy to thin out much that is of little use either for growth or for fruit production. By doing so the remaining branches take a new lease of life. They bloom freely, do not shed their fruit so much, and bear a crop of fruit better in size, quality, colour, and flavour, and one which shows greater uniformity and commands a better price and a readier sale.

Thinning is done by cutting off small leafy growths which make the inside of the tree-top denser and more compact; by removing dead twigs and branches; by suppressing branches that

cross or that run parallel with others more useful and more important; and by removing rank water shoots. It must not be ruthlessly done, of course. When that pruning has been done the outlines of the orange tree look symmetrical. It is formed by branches radiating from the stem and from the main branches in an outward direction. Both the air which carries the materials used in building up vegetable tissue and rays of light without which that building-up process cannot take place freely penetrate the tree and maintain it in health.

Trees thus thinned out afford less favourable shelter and hiding place to scale insects and spores of fungoid diseases, and the plant being less overcrowded keeps healthier.

Large wounds should be well pared off with the knife, so as to heal more readily. Some cover these wounds with a coating of white lead, tar, gum-shellac varnish, clay, or some other protective ointment.

PRUNING THE LEMON.

The lemon differs somewhat from the orange in its habit of growth. It forms a less compact head, and sends up long, flexible, pole-like branches, which sway as the breeze blows. From these long branches shoot out laterals, which carry the fruit. Those branches growing more or less horizontally are more productive than those other more vigorous ones which shoot up straight. At the start the lemon is treated somewhat like the orange. A few branches radiating round a central stem are left on, and these soon cover themselves with laterals. If the straight growing ones are permitted to remain on they absorb the greater flow of sap to the detriment of the other branches. Straight-up growth means rank growth, and as fruitfulness and strong growth do not generally harmonise, it is found advisable to remove right off those shoots which grow straight up, and thus divert the sap into the more profitable channels of the side branches. As mere shortening of the top and side growths would simply result in a multiplication of new branches, the harm would be intensified, and it is, therefore, advisable to cut clean off the strong, upright shoots, leaving the more fruitful horizontal twigs.

The general appearance of the shoots fairly well indicates what growths to cut and what to leave for fruit. The rank, upright shoots which should be cut clean off are more or less angular, and have longer thorns and narrower leaves of light green colour. The others, the fruiting branches, are rounded, carry broader leaves, of deeper green, and are less thorny. Wickson, in "California Fruits," advises pruning at different times of the year, according to the end in view. Spring pruning promotes wood-growth, and young trees should be pruned at that time; whereas pruning in the summer, to repress growth and induce fruitfulness, suits older trees better.

Large unwieldy lemon trees, which carry a quantity of their fruit high up in the air, where they are swayed about by the wind, get thorn scratched and sunburnt, and are less easy to pick, may be cut back to a lower storey. The removing of the top, radical as it is, seems to add to the fruitfulness of the out-growing branches. This system of training young trees, which in California is known as the Baronio method, after the grower who advocated and first practised it, now finds much favour. Even applied to old trees the suppression of all sky-tending shoots seems to react favourably on the bearing of the tree, and adds to its measure of usefulness.

DISEASES OF STOCK.

By R. E. WEIR, M.R.V.S., C.I.S.

DISEASES OF THE DIGESTIVE ORGANS.

Owing to the relative smallness of the stomach of a horse, it is in consequence very rarely the seat of disease, any derangement of the digestive tract being more commonly found in the intestines. The most frequent disease from which horses suffer is colic. This term is applied to almost all diseases of the organs of the abdomen that are accompanied with pain, and as the causes and seat of complaints are various, the treatment cannot always be the same.

Colic may be classed under the following headings:—

(1.) Engorgement.
(2.) Obstruction.
(3.) Tympanitic.
(4.) Spasmotic.
(5.) Worm Colic.
(6.) Sand Colic.

The general symptoms of abdominal pain are restlessness, laying down, looking round towards the flank, kicking with the hind feet, upwards and towards the abdomen; jerky switching of the tail; frequent changing of the position, and groaning. Usually the pain is not constant, and during the intermission the horse may eat and appear normal. When severely pained, the horse perspires freely and the breathing is hurried.

Engorgement Colic.

This form of colic consists of an overloading of the stomach with food. The horse may have been overfed or the food may have collected in the stomach through failure of the organ to digest it. Even a normal amount of food which the horse is accustomed to

may cause the complaint, hence a sudden change may produce engorgement. Continued full rations while a horse is resting for a day or two, or working too soon after feeding, may also serve as a cause. New oats, corn, or hay, damaged food, or food difficult of digestion, such as barley or beans, may excite engorgement colic. Greedy eaters are predisposed to this disease.

Symptoms.—The horse shows the general signs of abdominal pain, which may be long continued or of short duration. Reaching or vomiting movements are made. These are shown by laboured breathing, up-turned upper lip, contraction of the flank, active motion at the throat, and drawing in of the nose towards the breast, causing high arching of the neck. The horse may assume a sitting position on its haunches, and at times the pain is most violent while at other times the animals will appear depressed. As the horse cannot vomit except when the stomach is violently distended, it frequently happens that when free motion is noticeable, the stomach is then in such an extended condition that rupture of the walls follows, and recovery is then impossible.

Treatment.—In this form of colic it is necessary to give medicine which will relieve pain and is easily absorbed.

Morphine.—Five grains may be placed in the mouth and repeated at frequent intervals, and injections of warm water every four hours should be made so as to relieve the tension of the stomach.

Obstruction Colic.

Impaction of the large intestines is one of the most common bowel troubles of this form of colic and requires prompt treatment, otherwise serious consequences very soon ensue. The cause is due to overfeeding, especially on bulky food containing an excess of indigestible matter. Old dry food when largely fed, deficiency of secretion of the intestinal tract, lack of water and want of exercise. Slight abdominal pains mark the early symptoms, which may disappear for a time to re-appear with greater violence. The fæces are passed somewhat more frequently but in smaller quantities and dryer. The abdomen is full but not distended, the horse paws a little and looks back at its side, and when lying will frequently be found on its side. It occasionally lifts its head to look round at its side. By applying the ear to the flank little if any sound may be heard, indicating absence of the motion of the bowels. The treatment should consist in aiding the movement of the bowels, and preventing inflammation from setting in. For this reason a large dose of purgative medicine should be given as early as possible. For draught horses—seven to eight drams of aloes, and to lighter horses 4 to 6 drams combined with calomel and nux vomica, or if aloes is unobtainable, a pint of linseed oil combined with ten drops of castor oil. No further medicine should be given for 24 hours, when, if the pain has not altogether ceased, calomel and opium in half dram doses may be given. Allow the horse free access to water,

but no medicine should be given until the medicine has acted and the pain ceased, when mashes of linseed and bran are to be given.

Tympanitic or Flatulent Colic.

This is of frequent occurrence when a sudden change of food has taken place, such as from dry to green, or *vice versa*. Too long fasting, or food which has become sour in the manger, will also be the cause, in fact anything which gives rise to indigestion may produce the complaint. The first noticeable symptoms are dullness; the animal paws slightly. The pains are continuous from the first, and the abdomen gradually enlarges until it becomes very much distended. The breathing then becomes laboured and difficult, with profuse perspiration and trembling of the front legs; the animal sways from side to side, and if relief is not secured death soon takes place.

Treatment.—A dose of opening medicine should be given as early as possible. Interjections of turpentine, linseed oil, and warm water may be given frequently throughout the attack.

Spasmodic or Cramp Colic.

This form of colic is produced by contraction or spasm of a portion of the small intestines. It is produced frequently from large drinks of cold water when the animal is warm, indigestible food, chill, etc., etc.

Spasmodic colic always begins suddenly. If feeding, the horse is seen to stop abruptly, stamp impatiently and look back at its sides. Very soon the pain is increased, and this is shown by the animal lying down and rolling violently. During the period of pain the intestinal sounds are louder than when in health. There is an interval of ease when he will probably resume feeding as if apparently well. In a short time, however, the pains return with increased violence, and unless relief be speedily given the pain is almost continuous. Attempts to make urine are frequent in this complaint, and this leads many to suppose that the kidneys are at fault, but as a matter of fact disease in these organs is exceedingly rare.

The treatment should consist in the administration of medicines which will relieve pain. Doses of chloral hydrate, one ounce to a pint of water. A common and good remedy is sulphuric ether and laudanum, of each one ounce to a pint of water or half pint of linseed oil. If nothing better can be secured, give four ounces whisky and one ounce ginger in a pint of hot water. If the cause is due to irritants in the bowels and the pain does not cease after the second dose of the above, an aperient must be given—half to one pint of linseed oil.

Worm Colic.

A number of parasites are to be found within the intestines of horses, but the more common are the long round worm which inhabits the small intestines, and the small needle-like worms found

in great numbers in the large bowels. Besides these we have bots, which are to be found adhering to the walls of the stomach.

Symptoms.—It is not always possible to say if an animal is suffering from worms. The only certainty is when the worms are found mixed with the fæces. The animal may appear unthrifty and show slight colicky pains at times. The appetite may be depraved, and the animal given to eating earth, and may develop a particular fondness for salt. Switching of the tail and other symptoms are also noticeable. Although it is not always possible to state definitely that an animal is suffering from worms, treatment can always be given without injury to the animal. Amongst the best worm medicines are santonine, turpentine, infusion of tobacco, and bitter tonics. The best time to administer medecine is in the morning, when the animal has fasted all night, and the above treatment should be followed a few days afterwards with a dose of purgative medicine. It should be borne in mind that worms are usually found in horses that are in poor condition, and an essential part of treatment is to improve the appetite and powers of digestion. This is best done by giving vegetable tonics, such as gentian, Peruvian bark, and ginger in half-ounce doses.

Sand Colic.

This form of colic is common throughout Australia, and particularly in this State during spring. When the young feed commences to grow, the heavy rains cause a deposit of sand to be thrown on to the blades of grass, and horses which are permitted to graze on pasture of this nature consume a large quantity of this foreign matter, which, accumulating in the large intestines, causes irritation of the organ, supervening in inflammation and sometimes death. The symptoms are falling-off in condition, drowsy, listless appearance, dropping of the abdomen, intermittent colicky pains. When lying down the animal will generally be found in a natural position with the abdomen resting on the ground, thus affording relief to the over-strained bowels.

Preventive Treatment.—During spring, and before the grass has attained any appreciable length, the animals (especially on farm lands) should be fed at least twice daily on mashes of bran and chaff.

When suspicion exists that sand is present, linseed, together with a small quantity of flour, requires to be added, and when colic is present, small doses of linseed and nux vomica require to be given.

CATTLE.

TYMPANITIS, OR HOVEN.

This is known as distension of the rumen or paunch with gas, and usually supervenes from sudden change of the food, such as from comparatively dry food to succulent grasses or clovers, more especially when in a moist condition. Overfasting, when afterwards

supplied with rich food, may be the cause, or it may result from other diseases. The symptoms are usually rapidly developed; a swelling appears in the left flank, and this rapidly increases until distress on the part of the animal is noticeable, such as laboured breathing and panting. As the disorder advances, the right side becomes equally swollen, and the animal is then in a very dangerous condition of collapse or rupture taking place. Treatment will depend on the cause. Relief may be given in many instances by administering a full dose of diluted ammonia, ether, turpentine, or alcohol. Exercise and friction to the abdomen also hastens expulsion of the gas. When the cause is due to food lying dormant in the rumen, a full dose of purgative medicine is necessary, and Epsom salts ($1\frac{1}{2}$lb.) is the best purgative for cattle. This should be combined with ginger, treacle, and salt. When the animal is in distress and severe or extreme measures have to be taken, puncturing the rumen with a trochar or broad-bladed knife will have to be resorted to. After reduction, food of a light and easily digested nature requires to be given for a few days.

Choking.

This is a common complaint with cattle feeding on roots. A potato, piece of turnip or mangel; also the cause may be due to a small piece of wood; or dry meal, through improper mixing with the saliva, forms into a ball and becomes lodged in the passage of the stomach. The general signs are those of uneasiness, continued moving of the jaws, and saliva flowing from the mouth. The appetite is lost, and when the animal drinks the fluid returns through the nostrils, gas is generated, and the animal appears hoven. The obstruction may take place in the throat, midway down the neck, or within the thorax just before reaching the stomach. If the obstacle is confined in the throat it may easily be seen and removed by placing a balling iron in the animal's mouth and passing the hand down and grasping it. If midway down the neck a swelling will be noticed at the particular point, and pressure applied from below may cause the body to be brought back to the mouth. If this is impossible, the probang requires to be gently pushed down and the obstruction passed into the stomach. This latter method will have to be pursued when the foreign body is fixed in the third position within the thorax.

Impaction of the Rumen.

This complaint is of frequent occurrence amongst cattle throughout this State, and has been the cause of much mortality in the past. This is to be attributed to the dry, coarse nature of the herbage upon which the cattle have to subsist, more particularly during the long dry summer season. What is known as "Guildford grass" is frequently the cause of this complaint, and for this reason is a source of trouble to many stock-owners in certain districts. When impaction has been established for any length of time it is most difficult to effect a cure, as the affected organ

becomes partially paralysed, and is unable to act on its contents. Sudden changes from sparse pasture to that of abundant and succulent nature is also a common cause of impaction, and the same results will follow when fed artificially on rich food. As the symptoms develop themselves slowly, the disease is frequently in an advanced stage before anything abnormal is noticeable. Dullness is one of the first signs, to be followed by loss of appetite and cessation of rumination. The left flank appears fuller, and feels hard when pressure is brought to bear upon it. Stiffness is noticeable when the animal is made to move, and is accompanied by pain and distress. In the early stages of the disease a strong purgative should be given, mixed with a large quantity of fluids. This is to be followed by repeated doses of stimulants, such as ales, spirits, or liquor ammonia. When the disease is in a more advanced stage, small doses of linseed oil combined with nux vomica should be given. In more urgent cases still, when medicinal treatment is of little value, an operation by means of cutting into the flank and removing two-thirds of the contents of the stomach is compulsory, but this can only be undertaken by a person well experienced with work of such nature. During the course, and for some little time after treatment, food of an easily digestible nature requires to be given.

BLACK SCALE AND FRUIT FLY PARASITES.

By T. HOOPER.

The black scale parasite, *Scutellista Cyaneo*, was imported into California from South Africa, and introduced into this State from California on 20th July last, by Mr. Compere.

The insects arrived in the pupa stage on an oleander bush infested with the black scale (*Lecanium Oleæ*).

These pupæ started to hatch out on Wednesday, 31st August, after a few warm days. Eleven were then collected and transferred to a breeding cage. The cage is made like a box—a foot square and five feet long, and stands on end. There are two glass doors, one near the top and one near the bottom; also a glass window, so that one can see the interior of the cage, and in addition are two gauge windows for ventilation. In this cage, before liberating the parasites, were placed one orange and two oleander trees infested with the black scale. On 2nd September I added another parasite to those in the cage. From these twelve insects we should have another generation in about six or seven weeks'

time. The next batch that hatch will be liberated in the open on some badly-infested tree. Thus, by breeding some in the cage and letting others go, we hope in one at least, if not both, methods to establish one of the best of black scale parasites, which, combined with those already established here, should keep the black scale in thorough subjection in this State.

FRUIT FLY PARASITE.

On 22nd August one female parasite was hatched and liberated in Adelaide Terrace in a maggot-infected garden, in addition to some five or six of both sexes already released there. On the 2nd September two more female parasites were also liberated in the same garden, while in the cold storage are a number of pupæ of the parasite. These are being held over until summer, when some early fruit infected with maggots will offer more favourable conditions to the establishment of this valuable parasite.

POULTRY NOTES.

By FRANK H. ROBERTSON.

POULTRY ON THE FARM.

I do not suppose there is a farm in Western Australia without some fowls. Many have only a few, just sufficient to afford a supply of eggs and an occasional fowl for the home table, but few farms have a surplus for marketing. So many farmers find the fowls such a nuisance, owing to their getting into every place where they are not wanted, thus causing damage to the haystacks, scratching up growing vegetables, spoiling the flower beds, and damaging the vines and fruit trees, a nuisance in the stables, and soiling the machinery and buggy by roosting on them at night time, their presence is only telerated at the urgent request of the wife, who so well knows the advantage of having a supply of eggs for the table, and a fowl comes in very handy when meat supplies have run out.

Now all this trouble could be very easily avoided by making things secure by the use of wire netting, either by keeping the fowls within enclosed runs, or else by netting in the stables, sheds, and garden. If enclosed runs are decided on, they should not be small and over-crowded, such as one sees so often in the suburbs of Perth. But fowls always do much better when given a quite free run. They keep in better health, the eggs are more fertile, and

chickens hatched are strong and easy to rear; whereas, if fowls for breeding are confined, they so often get too fat from want of exercise, consequently the eggs are not so fertile, and those that hatch are harder to rear; besides, there is more work and attention required in looking after fowls when penned up; therefore, if it can possibly be managed, wire in the places they are not allowed to intrude in, and let them have a free run, so that they have plenty of exercise, and can pick up a great portion of the food which suits them best, in the shape of refuse grain, green feed, worms, and insects. Some pens and runs will be found of great use; in fact, they are almost indispensable, as explained farther on.

A good way to run the poultry on the farm would be to have a breeding stock of, say, 40 or 50 hens, running free with, say, half-a-dozen cock birds. The hens and chickens should be put into light, but rain-proof movable coops, with openings so that the chickens can run out on well-grassed land, and moved every day, and the chickens, when old enough to leave the hen, could be allowed free run; but they would do better if transferred to a good-sized enclosed run and then properly fed and attended to, until big enough to turn out with the full-grown birds. The cockerels should certainly be placed in a run by themselves, because, if allowed to run wild all over the place, they become a great nuisance and do not mature properly; but where practicable, the colony system, which has already been explained in the columns in the *Journal*, would be a good way of dealing with the cockerels; that is, to take them away at night-time, to movable or temporary houses located on the stubble fields some distance away from the homestead; there they could fatten on the refuse grain lying about until sufficiently grown for the market. Water would, of course, have to be supplied.

Poultry kept in the manner described, instead of being considered a nuisance to the farmer, would be a good paying branch of the farm products; provided, of course, that some person took control of the fowls who would take an intelligent interest in their welfare, and as an inducement to attain that end it would be found advisable to give a bonus of, say, 6d. per head for every chicken reared up to six months old, and, say, a commission of 2½ per cent. on the net proceeds of all sales of poultry and eggs. To raise 200 fowls a year would give, say, 100 head to sell, fetching, say, £15 at the low price of 2s. 6d. each; and at a low computation there should be 800 dozen eggs to sell, which, at an average price of 1s. 6d., would fetch £60, thus making a return of £75, a very nice little addition to the income of any mixed farmer, less the commission of about £7 to the person looking after the fowls, and as this would in most cases be a junior member of the household, it would still remain in the family. The figures quoted are all well within the mark, and are for common or mongrel fowls; whereas if pure-breds only are kept and bred the turnover would be considerably greater. The expense of the necessary timber and wire netting would not be great, and it would certainly pay well and save no end of trouble and annoyance in working the other branches of the farm products.

This is just the point where so many farmers fail, viz., the expense of buying wire netting and timber. They take it for granted that it would be a waste of money to spend anything in the shape of conveniences or appliances for poultry. I say take it for granted, because they do not bestow any thought or consideration about the question at all. If they did it would soon be found that with fair attention the raising of ducks, fowls, and eggs would be found to yield a handsome profit.

POULTRY AT AGRICULTURAL SHOWS.

The writer has been at nearly all the exhibitions of poultry held by the various poultry societies in Perth and suburbs, also a few in the country and the goldfields districts. The displays, taken all round, were first class, and afforded an excellent opportunity for persons interested in poultry to become acquainted with the outward appearances of the various breeds, and one which was very largely availed of by the residents of the towns where the shows were held. A very keen interest was generally displayed both in the qualities and merits of the various exhibits and poultry in general, but at all the shows it was remarkable to note the almost entire absence of visitors from the ordinary mixed farms, particularly in the two agricultural districts where poultry shows were held.

The annual agricultural shows will take place during the coming two or three months, and the writer hopes to attend as many of them as possible, and will be pleased to personally meet farmers who are desirous of obtaining information on matters relating to poultry management. Secretaries of societies are reminded that lectures, illustrated by lantern views of all the various breeds, can be given on show night, and the general public are informed that pamphlets on "Poultry Management" and on the "Treatment and Eradication of Fowl Tick" may be obtained free on application to this Department.

HOW TO KEEP EGGS.

PERSONAL EXPERIENCES OF A PRACTICAL WOMAN.

Mrs. A. Bosley in the *California Cultivator:* I, personally, have tried in the last 20 years the following ways of keeping eggs: Rubbing the eggs all over with a small piece of butter to fill and close all the pores, eggs keep fairly well for three months; the same by coating them with vaseline. Packing in sand with the little end down, fairly satisfactory; placing in bran same way, also in saw-

dust, unsatisfactory; in wood ashes, also unsatisfactory. Putting down in lime and salt solution, fairly satisfactory, if the lime is not strong enough to cook the eggs—and lastly, the liquid glass solution, which is thoroughly satisfactory in every way. The following formula of silicate of soda (called also "water glass" and "liquid glass"), varying slightly in strength, was used with success in tests made at the agricultural experiment stations of Rhode Island, North Dakota, Montana, and in the Dominion of Canada:—

Formula: Water glass (silicate of soda), one part; water that has been thoroughly boiled and then cooled, seven parts; mix the water glass with the water thoroughly, pour the solution over the eggs.

The proportions of water glass to the cold boiled water varied in the different experiments from one part water glass and five parts water, to one part water glass and 10 parts water. In the above formula I quote a happy medium, and the one I tried myself a year ago with perfect success. All tests made at the experiment stations proved satisfactory, some eggs being kept 10 months. In all the tests the eggs were placed in stone jars.

Last year, on the 13th of March, a neighbour and I put some eggs into the water-glass as an experiment, and when we ate them at the end of eight months, found them to be in a state of perfect preservation. The eggs, when broken into a saucer, would stand up as if new laid; they were, in fact, perfect in looks, taste, smell, and for cooking. I believe that eggs from hens kept without a male bird, and gathered fresh every day, placed immediately in the water-glass, would keep over a year, and in perfect condition. The water-glass does not stain the eggs; it makes them feel smooth and clean. Eggs, of course, must be clean when put into it.

The eggs I tested were placed, some in a stone jar, others in a five-gallon tin oil can. Those in the tin did not do so well, as the tin rusted and discoloured some eggs. Another year I would place them in stone jars or small wooden kegs. The water-glass costs 75 cents. at the drug store per gallon. One gallon is enough to keep about 75 dozen eggs. A weight should be used, a stone on a board to keep the eggs down under the solution, for, of course, if they come out into the air they will spoil.

I would strongly advise anyone wishing to keep eggs to dispose of all the male birds, for when an egg is fertilised it has the small germ of life in it; when the egg is kept a certain time the germ dies, then there is death—the dead germ in the egg, which decays—and a bad egg is the result. Eggs not fertilised keep much longer and have a much better flavour. So dispose of your useless roosters. Eggs should be kept in a cool place always.

Source of the new Bark Industry—Eucalyptus Occidentalis, the Flat-topped Yate.

By Dr. Morrison.

Some years ago a sample of bark was received at the Department of Agriculture, with a view to the identification of the tree from which it was derived. The name "Mallet" given to it was unknown in botanical literature, and an identification could of course not be made from the bark alone, a flowering branch of the tree being essential for that purpose. The request for the flowers and leaves of the tree was never complied with, and it was only quite recently that specimens were received, from which the identity of the plant could be ascertained. It was then found that it was one of the gum-trees, *Eucalyptus Occidentalis*, already well known about Tenterden, etc., as the "Flat-topped Yate." It does not appear how or why the tree should have received the name "Mallet;" but this is a case illustrating the way in which the lamentable confusion in the nomenclature of the gum trees has arisen in all the Australian States. The same species may be known by different vernacular names in the one State, but by other names in neighbouring States, while the same English name is applied in various parts of Australia to entirely different species. The confusion that results might be avoided by ascertaining what is already known about the trees before a new name is applied, and, failing that, by dropping the more recent name in favour of the old, especially if the latter has been derived from the aborigines, whose right to priority could not be disputed.

Feeding Cattle with Different Quantities of Concentrated Foods.

One of the best known cattle feeders of the last generation used to remark that "cake and corn given in moderation and with skill for six weeks before cattle are sent to the fat market will pay the feeder, but to continue this for more than two months will never pay." His notion of a moderate feed was 6lbs. to 8lbs. per day. Before commencing to feed with concentrated food he got his cattle into a forward condition either on grass or by feeding on straw and turnips. It may be urged that in the three-year-old cattle that were then obtainable, satisfactory returns could be secured in this way, but that the statement does not apply to the present time, when cattle are as a rule fed off at a younger age

There is doubtless some force in this argument, but we venture to think that little calculation is required in order to show that cake-feeding for long periods is now rarely profitable, particularly where the animals receive a considerable quantity. It is, of course, occasionally possible to buy stores at a low price and sell beef at a high one, but during recent years stores have, as a rule, been disproportionately high as compared with the price of beef, with the result that on many occasions it is to be feared feeding has been conducted at a loss. Many farmers who feed cattle in winter are satisfied if the animals leave their manure free of cost, but in a great number of instances this modest requirement has not been met.

In 1898 the University College of North Wales carried out an experiment at Lledwigan with Welsh bullocks, whose live weight was, on the average, about 10cwt. One lot received cotton cake and maize meal at the rate of 6lbs. per head per day, and the other at the rate of 10lbs. per head per day. The other foods were practically the same. The detailed report published at the time shows that the low-feed lot gave a considerably better return. In concluding the report, we ventured then to hazard the opinion that although 12lbs. or even 14lbs. of concentrated food per head per day was frequently given to cattle, that an allowance of 6lbs. or 8lbs. per day would in most cases prove more profitable when feeding cattle similar to those used in the experiment.

Of late years many farmers have found it more remunerative to turn out their cattle as good stores rather than to convert them into beef. There has consequently been a diminution in the number of those who may be termed heavy feeders. This class has not, however, ceased to exist, and it was with the object of throwing a little more light on the practice of heavy feeding that the experiment detailed below was commenced. It will doubtless be accepted as true that if ever heavy feeding is profitable, it is more likely to be so where cattle are fed for a short rather than for a long period. We decided in October to select a lot of Welsh bullocks and to feed them for six or seven weeks, giving one lot what we regarded as sufficient concentrated food, and another and similar lot half as much again. For the purpose, 16 three-year-old Welsh bullocks, which had been grazed together for five months, were purchased. Ten were selected from the number, and these were divided into two lots of five each. As the 10 averaged about 12cwt. each, it was thought that 10lbs. per head per day of concentrated food would be a good allowance. This quantity, therefore, was given to Lot I., while Lot II. received 15lbs. per head per day of the same foods. The two lots received in addition as many swedes and as much rough fodder as they would eat. The cattle were housed on October 31st, and all received the same quantity of the foods on which they were to be fed in the trials. On November 3rd, after they had got accustomed to the food, the two lots were weighed and the experiment commenced. The average daily rations consumed by the two

lots from that date until December 23rd, when the experiment was concluded, are given below:—

Lot I.—100lbs. pulped swedes, 10lbs. hay (chaff), 10lbs. straw (chaff), 4½lbs. long hay.

Lot II.—92lbs. pulped swedes, 9lbs. hay (chaff), 9lbs. straw (chaff), 3lbs. long hay.

At the outset the bullocks in Lot I. each received a daily allowance of 4lbs. decorticated cotton cake and 6lbs. of maize meal, and those in Lot II. 6lbs. decorticated cotton cake and 9lbs. of maize meal. At the end of a month, half the cotton cake was in each case replaced by an equal weight of linseed cake, and one week later the other half of the cotton cake was also replaced by linseed cake. It will be noticed that Lot II. consumed fewer swedes and rather less rough fodder than Lot I. Both lots had constant access to water, which, however, they rarely drank.

The analyses of the concentrated foods were as follow:—

TABLE I.

	Decorticated Cotton Cake.	Linseed Cake.	Maize.
Water	10·1	13·79	14·66
Albuminoids...	43·3	30·12	9·25
Fat	8·5	9·08	3·26
Carbohydrates	25·4	34·51	69·15
Fibre	6·2	7·80	2·40
Ash	6·5	4·70	1·28
	100·0	100·00	100·00
Price per ton	£7 12 0	£7 15 0	£5 10 0

Tables II. and III. give the weight of each animal at the commencement and at the close of the experiment:—

TABLE II.—LOW-FEED LOT.

No.	Live Weight Nov. 3.			Live Weight Dec. 23.			Increase in Live Weight.			Daily Increase in Live Weight.
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	lbs.
I.	12	2	14	13	3	0	1	0	14	2·52
II.	11	3	0	12	2	0	0	3	0	1·68
III.	11	3	0	12	1	21	0	2	21	1·54
IV.	11	2	21	13	0	0	1	1	7	2·94
V.	12	0	10	13	2	0	1	1	18	3·16
Total ...	59	3	17	65	0	21	5	1	4	

Average increase in live weight, 1cwt. 0qrs. 6lbs.
Average daily increase in live weight, 2·37lbs.

TABLE III.—HIGH-FEED LOT.

No.	Live Weight Nov. 3.			Live Weight Dec. 23.			Increase in Live Weight.			Daily Increase in Live Weight.
	cwt.	qrs.	lbs.	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.	lbs.
I.	11	1	14	12	0	14	0	3	0	1·68
II.	12	0	0	12	3	14	0	3	14	1·96
III.	11	3	0	13	0	7	1	1	7	2·94
IV.	12	0	7	13	1	7	1	1	0	2·8
V.	13	0	7	14	2	7	1	2	0	3·36
Total ...	60	1	0	65	3	21	5	2	21	

Average increase in live weight, 1cwt. 0qr. 15lbs.
Average daily increase in live weight, 2·55lbs.

The tables show that on the average the animals in the "high-feed" lot gained in live weight 9lbs. more per head than those in the "low-feed" lot.

Taking the prices of the concentrated foods as given in Table I., and valuing the hay at 50s. per ton, the straw at 30s. per ton, and the swedes at 8s. per ton, we find that the food for the "high-feed" lot cost 9s. 3d. more than for the "low-feed" lot. As the extra food supplied only produced an increase of 9lbs. per head live weight it is clear that, as compared with Lot I., the cattle in Lot II. were fed at a loss. It should, however, be said that they were of somewhat better appearance than the others at the close of the experiment, but in the opinion of an experienced butcher and cattle dealer the difference between the two lots was not sufficiently marked to affect their relative money values.—*Live Stock Record.*

A FEW DISEASES OF SHEEP AND THEIR PREVENTION.*

Diseases of sheep and their prevention offer a wide field for scientific inquiry. Even in this country there is plenty of work in this direction for those who care to undertake it.

Members of the veterinary profession are frequently accused of knowing little about the diseases of sheep, but the fault scarcely lies with them. Owing to the comparatively small value of the individual animal, it does not pay the farmer to call in the veterinary surgeon to advise upon the treatment of a sick sheep, and so the practitioner has few chances of studying the common diseases of sheep.

* A lecture read by T. W. Cave, F.R.C.V.S., Professor of Veterinary Surgery in the South-Eastern Agricultural College, Wye, Kent, at the Sheep Breeders' Conference.

It is only in cases of widespread outbreaks of disease that professional advice is sought, and then the busy practitioner has not the time to spare for a long and careful scientific investigation. For research work of this kind much time is required, as it frequently happens that epizootic diseases of a dangerous character only occur periodically and at particular seasons of the year, and several years may easily be occupied in the investigation of a single disease.

Sheep are very liable to suffer from epizootic diseases, some of which are due to parasites, others being of microbic origin.

This liability to disease is due to several causes:—

(1.) Where sheep-breeding is extensively carried on, as, for example, in the county of Kent, the land is always heavily stocked with sheep, and with sheep only, and has been grazed over by sheep for generations, and consequently the soil has become saturated with the various parasites of which the sheep is the natural host, or with the microbes of those germ diseases to which sheep are liable.

(2.) Sheep, being close-feeders, are peculiarly liable to pick up the young parasites which live in the herbage near to the surface of the soil, or to become infected with the disease-producing organisms which may enter the system through the digestive apparatus.

(3.) In districts where diseases like Braxy and Blackquarter are met with, the land must constantly receive fresh supplies of disease-producing organisms which escape from the bodies of dead animals, especially when the carcases are flayed and cut up, or, after flaying, are allowed to be eaten by dogs, vermin, etc. The countless myriads of microbes which each carcase contains are allowed to contaminate the soil, and consequently such diseases appear with unfailing regularity at the proper seasons.

It is owing to such conditions that the sheep-breeder is compelled to face the possibility of heavy losses being experienced through outbreaks of epizootic diseases.

The farmer who occupies a mixed farm of arable and pastoral land, and who is not compelled by circumstances to depend on sheep alone, can scarcely realise the difficulties to be faced by the man whose holding only carries sheep.

In preparing this paper I have had some difficulty in deciding upon the diseases to be discussed, but I have chosen a few diseases which are greatly to be dreaded in a sheep-breeding district such as Kent.

LIVER-ROT OF SHEEP (FLUKE DISEASE).

When one remembers that 3,000,000 sheep died of liver-rot in 1879 in England alone, it is not surprising that many anxious inquiries have been made as to the possibility of heavy losses being again experienced. Owing to the excessive rainfall of 1903 many flock-owners feared that liver-rot might again cause extensive ravages among the sheep of this country, as it is now well known that wet seasons favour the development of the disease.

A short account of liver-rot, and a few remarks on the preventive measures which may be adopted, will not, therefore, be out of place at the present time.

Liver-rot of sheep is a parasitic disease caused by the presence of the common liver-fluke (*Fasciola hepatica*) in the livers of affected animals.

It is curious to note the fact that for years after the disease was first recognised the presence of the flukes was regarded as accidental, or the flukes were thought to be present as the result of the disease.

Now, owing to the investigations of Thomas and others, the whole life-history of the parasite is well known, and it is recognised that the parasite is the sole cause of the disease.

The common liver-fluke (*Fasciola hepatica*) inhabits the livers of various animals. It has been found in cattle, sheep, horses, donkeys, hares, and rabbits, and occasionally in man.

It is shaped something like a flat fish (sole), and is from one inch to one and three-quarter inches in length, and half an inch to three-quarters of an inch in breadth. Its skin is armed with numerous minute spines. Each parasite is hermaphrodite, and is capable of producing 45,000 eggs.

The eggs are oval in shape, and are discharged from the adult worm into the bile-ducts of the host, and, passing with the bile into the intestines, are expelled along with the fæces, and are thus scattered over the pasture.

Many of the eggs become dried and perish, but others are scattered over marshy ground, or are washed by rain into pools and ditches. When favoured by warmth and moisture, ciliated embryos are developed in a few weeks, and bursting from the eggs they escape into the water, in which they exist for a few days as free-swimming embryos.

The free-swimming embryos seek to attach themselves to certain small snails (*Limnœa trunculata*), into whose bodies they penetrate and take up their abode.

Here the embryos lose their cilia and develop into ovoid bodies which rapidly increase in size. These ovoid bodies are termed sporo-cysts.

Each sporo-cyst contains a number of germ cells, from which new forms known as *rediœ* are developed.

The *rediœ* escape from the sporo-cyst by boring through its soft wall, and then wander into the liver of the snail, where they settle down and produce another generation of new forms.

Each *redia* has within its body cavity germ cells which develop into new forms called *cercariœ*.

The *cercariœ* are minute tailed creatures, which ultimately develop into the adult parasites, which they more nearly resemble than any of the intermediate forms. Each *cercaria*, after passing out of the *redia* through a special opening provided for this purpose, bores its way through the tissues of the snail, and gets into water or moist ground. Here the *cercaria* attaches itself to a water-weed, or a blade of grass, and after shedding its tail becomes encysted, and waits for the sheep to come along and swallow it.

On reaching the stomach of the sheep the cyst wall is destroyed, and the young fluke is liberated. It then passes into the duodenum, and finding the entrance of the bile duct, pushes and wriggles its way through that tube to the liver, where it grows into the fully-developed fluke, and becomes sexually mature.

From this account of the development of the liver-fluke it will be seen that the parasite passes through three generations between the egg and the mature fluke.

First generation: Egg, embryo, sporo-cyst.

Second generation: Redia.

Third generation: Cerceria and adult fluke.

During this remarkable development there is a multiplication of the number of individuals derived from one egg.

For instance, from the egg a single free-swimming embryo escapes, and entering the body of the snail forms a *sporo-cyst*. The original *sporo-cyst* may then divide and so form two *sporo-cysts*, each of which is capable of producing seven or eight *rediœ*, and each *redia* may produce as many as twenty *cerceriœ*, which will become full-grown flukes on reaching the liver of the sheep. In this way a single egg may ultimately produce more than 300 flukes, and as a sexually mature fluke can produce 45,000 eggs, it will be seen that from a single mature parasite many millions of *cerceriœ* may be developed. This enormous fertility of the fluke is necessary on account of its complicated life-history, and the small chance any single embryo has of completing the entire life-cycle.

Sheep become infested with flukes by eating grass, on the blades of which are the encysted *cercerœ*. This usually occurs during July, August, or September.

When the young flukes reach the liver of the sheep, the irritation caused by their presence produces a hyperæmic condition of the gland, and there is an increased secretion of bile, which at first

seems beneficial to the animal. As is well known, for the first five or six weeks after the invasion of the liver by the young flukes the animal fattens rapidly.

Then appetite and rumination are disturbed, and the sheep gradually becomes feeble, falls easily, and winces on pressure over the loin. The conjunctival membrane becomes swollen, and forms a circular yellowish-white ring round the eye. The wool becomes dirty, dry, and brittle, and is easily pulled out.

Three months after infection, usually about the beginning of January, the sheep becomes rapidly worse, and soon shows great emaciation, a pendulous abdomen, a "razor" back, and a puffy swelling under the jaw. The wool falls off, leaving large patches of bare skin.

In this state the animal lingers until death ends the scene.

The mildness or severity of the attack will depend upon the number of the parasites present in the liver of the affected animal.

Where the number of flukes is large (and in a bad case the liver may harbour 400 or 500 flukes) the liver is so damaged that it becomes impossible for the sheep to live.

If the number of flukes is small the damage done to the liver is less serious, and the sheep may struggle on until the flukes leave the liver, about May or June, and then the animal may ultimately recover.

In such a disease as this medicinal treatment is practically useless. No drug is known which can destroy the flukes in the liver of the host, or bring about their expulsion.

Recovery can only take place when the number of flukes is comparatively small, and the liver escapes serious damage. In such cases good nourishing dry food and the administration of tonics may help the patient towards recovery.

As was mentioned above, sheep-owners have greatly feared that the excessive rainfall of 1903 would be followed by a heavy mortality of sheep from liver-rot.

There is no doubt that wet seasons are particularly favourable to the development of the liver fluke, but it is not at all likely that the parasite can be widely distributed at the present time in this country.

Owing to the long succession of dry years there must have been a great clearance effected throughout the whole country, and the parasites can only now exist in those situations where sufficient moisture is always present, even in the driest summer, for the preservation of the moisture-loving snail and fluke.

In such localities cases of liver-rot would occur annually, and from these dangerous centres the fluke may again become widely distributed should several excessively wet seasons follow one another in close succession. In years when fluke-disease is widely prevalent

it must always seem hopeless to attempt to carry out any scheme of preventive treatment, but in a long period of dryness, when the distribution of the fluke has been reduced to comparatively small areas, it seems possible to put into practice those measures which we know would tend to still further reduce the number of parasites, and also to further contract the area of those localities which harbour them and their intermediate host, the snail.

In Kent there are several localities in which patches of unsound land are known to exist, and where liver-rot affects the sheep annually.

During the past winter more cases of liver-rot have occurred in these places than for a number of years, and although there does not appear to have been any great extension of the dangerous areas, yet these plots of "rotten" land form dangerous centres from which a wide distribution of the fluke may take place in the near future.

It is possible that much good might result from the application of preventive measures in these well-known and at present limited localities.

All preventive measures are based upon what is known of the life-history of the parasite, and the investigations of Thomas have made it clear that four conditions are necessary for the production of liver-rot in sheep—

(1.) The presence of fluke-eggs.

(2.) Wet ground or water during the warmer weather in which the eggs may hatch.

(3.) A snail (*Limnæa truncubata*) which will serve as intermediate host.

(4.) Sheep must be allowed to feed upon an infected pasture without any proper precaution being taken to prevent infection.

Destroy any one of these conditions and fluke disease cannot occur.

It will, I think, be easy in those limited areas of which I have spoken to break down at least one of these conditions, and the sheep-owner who is aware of the existence of "rotten" pasture on his farm will be a benefactor to his neighbours as well as to himself if he will endeavour to improve the conditions of such dangerous land.

On such land, during the winter and spring months, fluke-eggs will be constantly scattered about either by infected sheep or other herbivorous animals.

These eggs will ultimately perish if they fall on dry ground. Wherever it is possible for the land to be dried by improved drainage, the destruction of fluke-eggs will be the happy result. Good drainage will also render the soil unsuitable for the existence of the necessary snail. Even the removal of surface water by the cutting of trenches will greatly assist in improving the land.

If further drainage of the land is impracticable, the destruction of the immature flukes and of the snails may be attempted by dressing the pasture with salt, or with a mixture of salt and lime. The dressing may be applied from May to August. During the same period all ponds and ditches should be carefully cleaned out, and the refuse should be freely mixed with salt or salt and lime.

All sheep pastured on "rotten" land from June to the end of October should receive a daily allowance of dry food, to which is added one-quarter of an ounce of common salt for each animal, or the salt and iron mixture mentioned below may be given daily in doses of one pint for each sheep.

SOUTH AFRICAN BLACK-SCALE PARASITE.

(Scutellista cyanea.)

By ALEXANDER CRAW.

This interesting, curiously-shaped, chalcid fly was first described from Ceylon, where it was found on *Lecanium coffeæ*. It was later found in Italy, attacking wax scales (*Ceroplastis rusci*). Through Dr. L. O. Howard's efforts it was introduced into Florida and Louisiana in 1898, to try it upon the wax scales of those States. I have no report from Florida, but in a letter from Prof. H. A. Morgan, Baton Rouge, La., dated February 6, 1902, he writes: "Several years ago I tried to introduce *Scutellista cyanea* here to work upon *Ceroplastis cirripediformis*, but got no results. I am anxious to try it again, and if your colony has increased sufficiently, can you not spare me a few?" As we have so much territory in California where the parasite is required, I have not yet sent Professor Morgan a colony, but will do so in the spring.

It was not until Professor Charles P. Lounsbury, Government Entomologist of Cape Colony, called attention to the *Scutellista cyanea* as an efficient enemy of the "black scale" (*Lecanium oleæ*) in that country, that its true value was recognised.

Through the efforts of the Hon. S. F. Lieb, of San José, and Mr. E. M. Ehrhorn, of Mountain View, Senator Perkins appealed to the U.S. Department of Agriculture to use its good offices toward securing this valuable insect. Several colonies were forwarded to Mr. Ehrhorn, but unfortunately without any practical results from either sending. On October 1, 1901, Professor Lounsbury wrote me: "By to-morrow's boat we start to you two boxes containing cuttings of oleander bearing parasitised scale. It

is not ideal material by any means and this is not the season we most wish to send in, but the scale and its parasites are both so scarce that we must send what we find as soon as we find it. Most of the scale in your vicinity will be old by the time this reaches you, but I am in hopes you may be able to get material from the south of the State that will take a generation of the parasite. Owing to the probable presence of secondary parasites, it is, of course, inadvisable to send the original material to any orchardist down there."

From this sending seventeen perfect insects developed, of which four were females. When placed in a breeding-case a small spider that was hidden in a rolled-up leaf, seized and killed one of the females, leaving us but three from which to colonise the State.

On December 26, 1901, I examined a full-grown black scale from the tree in the breeding-case, and found a small maggot of the *Scutellista cyanea*, about twice the size of a black-scale egg. This convinced me that they were breeding, so no further examination was made. On February 7, 1902, the parasites began to issue from the scales. During the warm summer months we find that the *Scutellista* passes through all its metamorphoses in forty-seven days.

Colonies have been sent to all the counties of the State where the black scale is troublesome. From personal examination and from material sent in, it is evident that the parasites have obtained a good start, and the coming season will, we hope, see them thoroughly disseminated.

Description.—In the female the antennæ are reddish-brown, with the ring joints and tips dark and more spreading than in the male. The antennæ of the male are black from the ring joints to and including the clubs, with the scape reddish-brown; the legs in both sexes are black, tarsi reddish-brown and claws black; the scutellum in both male and female is very large.

As the flies are small and very active it is difficult to detect them upon the tree upon which they may be placed, and the best way to determine if they are established is to remove and examine the inside of the full-grown scales about forty to fifty-five days after liberating the parasites. The larva is maggot-shaped and white, this soon changing to the pupa, which is black just before changing to the perfect fly.

[Illustrations of the black scale *(Lecanium oleæ)* and its parasite *Scutellista cyanea* were published in the last issue of the *Journal*.—ED. *Journal.*]

COOLING MILK.

There is no doubt that the quicker milk can be cooled after being drawn the better it and its product will keep. Cooling hinders the development of bacteria and so postpones souring. A very common way, where ice or cool water are not available, is to "aerate" the milk by allowing it to run over a machine constructed with suitable "riffles." This, of course, cools the milk more or less according to the temperature of the air, and it is also claimed that the oxygen of the air improves the milk. As to this, Professor Dean, of the Ontario (Canada) Agricultural College, declares that it all depends on the kind of air to which the milk is exposed. It may be purifying, and it may be contaminating. He does not believe in "aerating" in a barn or barnyard. At a dairy conference Professor Dean said: "Cooling of milk is a most important point. The advantage of cooling is that it prevents the growth of bacteria or organisms which are apt to develop bad flavours in the milk. There are two ways of cooling milk. One is by the maximum exposure to the air, and the other by the minimum of exposure to the air. The first method, the use of a cooler which will cool the milk rapidly, is a decided advantage. A disadvantage is that one must have water elevated or under pressure in order to use the ordinary cooler, and a great many farmers have not such a water supply. A second disadvantage is the labour of lifting the milk up into the cooler, and of washing the cooler afterward. The majority of farmers will not undergo the labour necessary to do this work properly. To lift the milk up, let it run over the cooler, and after wash the cooler, is more than the average man will do. Then there is the difficulty that by using such a cooler the milk is largely exposed to the air, and the same risk is run in the use of the aerator. Any form of cooler which cools the milk rapidly exposes it largely to the air, and while this gives opportunity for the gases and volatile oil to pass away, impurities are apt to be absorbed. To overcome this difficulty various devices have been suggested to cool the milk under cover. Probably the best plan is to set the cans of milk in tanks of cold water. Running water at a temperature of 40 to 50 degrees gives the ideal conditions. Where that is not obtainable ice will be necessary to get the milk properly cooled. In that case the milk should be sufficiently stirred while cooling to bring the cool milk from the outside of the can to the centre, and so facilitate the rapid cooling of the milk with a minimum of exposure to the air. Milk for factory work should be cooled to a temperature at least below 70 degrees, to 60 degrees if possible. Where the milk is paid for by the fat content the owner is assured of better and more uniform tests if he will stir the milk and keep the cream from rising."

MANURIAL EXPERIMENTS IN CANADA.

At the Canadian Experimental Farms some manurial experiments have been carried out for a period of 14 or 15 years with a view to testing the application of the principal fertilisers on the more important grain crops. It is interesting to notice that these trials appear to show that farmyard manure can be most economically used in a fresh or unrotted condition. Fresh manure was found to be equal ton for ton in crop-producing power to rotted manure, which, as other experiments are stated to have shown, loses during the process of rotting about 60 per cent. of its weight. In the case of wheat and barley there was practically no difference in yields obtained from plots treated with dung either fresh or rotted, while the oat yield from the plot which received fresh dung was several bushels larger.

After constant cropping for 10 or 11 years it was found that the soil on those plots to which no farmyard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In the spring of 1899, 10lbs. of red clover seed per acre was sown with the grain on all the plots of wheat, barley, and oats. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage which was then ploughed under. In 1900 the fertilisers on all the plots were discontinued, and since then the same crops have been grown on all the plots from year to year without fertilisers, sowing clover with the grain each season. The ploughing under of clover was found most effective as an additional source of fertility, and notwithstanding the discontinuance of the use of manures the crops have in many instances been considerably increased. Even in the case of the two plots which had received farmyard manure up to the year 1898, no appreciable falling off in the yield seems to have taken place. In fact, in the case of barley the yield in 1903 was $41\frac{1}{2}$ and 37 bushels respectively on the two plots, compared with an average for the preceding 14 years of 35 bushels per acre in both cases, although the yield of straw was somewhat less.

The influence of the clover was very marked on the unmanured plots. Where wheat had been grown for 11 years without any manure the crop averaged $10\frac{1}{4}$ bushels; the yield during the five years during which clover was ploughed in showed an average increase of $4\frac{1}{3}$ bushels per acre, or over 40 per cent. In the case of barley, unmanured for 10 years, the crop averaged $13\frac{3}{5}$ bushels, but the tenth year the crop was reduced to eight bushels per acre.

Subsequently to the use of clover the crops yielded $10\frac{2}{5}$, $9\frac{1}{3}$, $10\frac{1}{6}$, $27\frac{2}{5}$, and $23\frac{4}{5}$ bushels per acre, an average increase of 20 per cent. The average crop of oats on unmanured land was $30\frac{1}{2}$ bushels per acre; with the use of clover they have stood for five years at 29, $47\frac{1}{5}$, $48\frac{1}{3}$, 46, and $37\frac{1}{5}$ bushels per acre, giving an average increase of $10\frac{2}{3}$ bushels, or over 31 per cent.

THE WOOL TRADE.

In dealing with the subject of the wool market at the present time, it is more than ever necessary to discriminate between the different descriptions of the staple, for remarks of a general character will no longer fill the bill. The strong-fibred wools—crossbreds and coarse sorts—continue to easily hold the splendid position they have lately taken; the demand for these qualities is exceptionally brisk, and although prices now current are a long way higher than they have been for upwards of thirteen years, manufacturers are far keener to buy crossbreds at the existing level than they were to touch them when they could be bought at 100 per cent. less money. Thus from the point of view of the New Zealand grower, or the English farmer, who is now being offered 3d. per lb. more for this year's clip than he was able to realise last year, and 5d. per lb. more than he obtained in 1902, the condition of things in the wool market leaves nothing to be desired. But Australian wool-growers are mainly interested in fine wools, and so far as these latter descriptions are concerned, there is certainly cause for some disappointment. The course of prices in the case of Merino since the date of our last issue has scarcely come up to expectations. In spite of the fact that prospects for this class of wool seemed to be amply secured by the circumstances of supply, there has been a total absence of bouyancy in the markets throughout the past month, and latterly sellers have found it a difficult matter to maintain values. Week after week nothing but quietness has been reported from Bradford, although prices there are lower than they were a year ago, and it is freely admitted that stocks in that centre are practically non-existent. In London also the quantity of wool on hand is unimportant, and there is very little afloat for that market. The position locally has no doubt been relatively better than that in the industrial centres. Here the Japanese demand, which has stood our markets in such good stead all through the winter, proved quite sufficient to impart a fairly strong tone to business. Coming along at a time when there was only a minimum amount of wool available for sale these Eastern orders have kept values firm, but the feeling is now gaining ground that immediately the paucity of supplies is relieved by the arrival of new clip wools, the compar-

atively small operations of this particular section of the trade will not go far to uphold the price level. For the past few weeks the inquiry on Continental account has been extremely slack, and Yorkshire buyers will only do business where they can obtain concessions. There is, indeed, an uncanny quietness about the market just now, and whether this is only a temporary lull or whether it foreshadows an easing down in prices remains to be seen.

It is, however, exceedingly likely that buyers will on several grounds consider themselves entitled to look for some reduction in Merino values as compared with rates paid for the previous clip. In the first place, owing to the attention bestowed upon crossbred wools by manufacturers, the consumption of Merino was lessened to an extent which practically balanced the decrease in the supply. Prices, instead of advancing in response to the further shrinkage in supplies, actually declined a little, rendering it difficult for dealers in fine wools to avoid losses. The past year has been a poor one for those who purchased wool in Australia last season, and buyers who could do no good out of such a small clip as the last was are hardly likely to care about making heavy commitments in the new clip, which will undoubtedly be one of substantially larger dimensions. Again, after making due allowance for the fact that the price of Merino has not advanced so far as it might reasonably have been expected to do by this time, the level of values is nevertheless a high one, leaving ample room for a long drop if anything of a serious nature cropped up to mar the course of trade, and no trader in such a sensitive article as our principal product is recognised to be can afford to let himself go so long as the situation in the Far East remains so pregnant with possibilities of really serious political complications, as it does at the present time. Apart from this, it is pretty clear that crossbred and coarse wools will not be easily ousted from the commanding position they now occupy. So far as the near future is concerned, there can be no displacement of these sorts by fine wools, for the reason that stocks of the latter are far too limited in Europe to admit of any such thing. Manufacturers will probably be only too glad to get back on to Merino wools as soon as the price and supply of same enables them to handle these sorts at a profit; but at present coarse wools are both cheaper and more plentiful than fine wools. There are, however, signs that if the basis of prices in Australian markets during the coming season finally settles down to a little below last season's level a very strong demand will ensue. The buying power will again be large here, and stocks in Europe are now so attenuated that the new wool will assuredly be wanted badly by the time any appreciable quantity of it can reach the mills. Besides this, it is pretty certain that, although Australian production will this season show a large increase, the world's supply of wool, as a whole, for 1905 will again be a long way below the normal. The outlook is consequently full of encouragement. Producers for another year at least can rest assured that the statistical position will favour them; and if during the period when the pressure of supplies is at its height prices ease

down a little, the movement would be one which would go far to enable Merinos to compete more successfully with crossbreds than it has done of late, and the pastoral industry as a whole will in any case benefit by the larger quantity of wool it will have for disposal.

LOCAL MARKETS.

The first wool sales of the new wool year were held in Sydney on the 21st and 22nd ult., but only small catalogues were available. Altogether about 2,000 bales, chiefly Queensland new clip wools, were submitted. Prices ruled firm for the best wools, but medium and inferior sorts went slightly in favour of buyers. The bulk of the best scoured forward was purchased for Japan at prices about on a par with those current in Sydney in June. A few lines of new greasy fleece elicited a good deal of attention, but there was no great rush to secure these at any price for testing purposes, as has been the case with first instalments of the new clip in former years. Indeed, quite a large proportion of these wools were purchased by local scourers, the balance being divided between the German and French sections of the trade. Of greasy wool, the Albilbah clip, from Isisford, Queensland, sold at up to 9d. per lb.; Legh Bros. over PD, from Central Queensland, brought 9¼d.; and the TH over Stony Crossing new clip, from Brewarrina, reached a similar figure. From Bourke, the Kay brand, which is always one of the first to be catalogued, sold at 7½d. In scoured wools the following sales were effected:—Albilbah (Queensland), 71 1st com., E. and W., 21¼d.; 72 1st com., 21d.; 8 1st com. RH, 19½d.; 73 2nd com., 20¼d.; 27 2nd com., 20½d.; 46 1st clo., 20d.; 7 1st clo., 19d.; 8 1st clo., 20¾d.; 12 2nd clo., 19¼d.; 51 1st lambs', 17d.; 52 1st pieces, 17d.; 17 1st pieces W, 18¼d.; 71 2nd pieces, 15¾d.; 19 2nd pieces W, 16½d.; 27 bellies, 14¾d.; 9 bellies W, 15d.; 10 stained pieces, 12d.; 22 locks, 9¾d. Burden over Q (Botany), 4 extra super H, 21¾d. Hastings over Q (Botany), 4 extra super clo., 24¼d. B over Esher (Brisbane), 23 AA com., 19d.; 82 2nd pieces, 10¾d.; JF over Dalmore (Longreach, Q.), 24 1st and 2nd com., 21d.; 4 1st clo., 21¼d.; 4 1st H, 20d.; 7 necks, 21d.; 15 1st pieces, 20d.; 4 2nd pieces, 18½d.; 4 bellies, 17½d.

BRADFORD MARKET.

Throughout the past month Merino tops have met with only a dull inquiry in Bradford, and although prices show no quotable change, it is felt that it is only the absolute bareness of stocks that is keeping them up. As compared with rates current in August last, values are now lower by nearly 1d. per lb., and any pressure to sell would probably bring them lower, nor would any users be prepared to purchase for forward delivery at present quotations. As a matter of fact, no one cares to entertain the idea of buying much ahead of requirements. With a war in progress it is recognised that anything might happen, and prices are at a comparatively

high and consequently dangerous level. The following table shows the price movement in 60's tops in Bradford since September, 1900:—

	60's Common. d.	60's Super. d.		60's Common. d.	60's Super. d.
1900.			1902.		
September ...	18¾	... 19½	September ...	22½	... 23½
October	17½	... 18½	October	23¼	... 24¼
November ...	17¾	... 18⅜	November ...	23	... 24
December ...	18¼	... 19⅜	December ...	23½	... 24½
1901.			1903.		
January	18⅜	... 19⅜	January ...	23¾	... 25
February ...	17⅞	... 18½	February ...	23½	... 24½
March	17¾	... 18½	March	23	... 24
April	18⅜	... 19¼	April	23¾	... 25
May	18½	... 19¼	May	24½	... 26
June	18	... 18⅞	June	24¼	... 25¾
July	18⅛	... 18¾	July	24	... 25¼
August	18¼	... 19	August	24	... 25
September ...	19½	... 20¼	September ...	24	... 25
October	19¾	... 20½	October	24¼	... 25
November ...	18½	... 19½	November ...	23½	... 24½
December ...	18¾	... 19¾	December ...	22½	... 23½
1902.			1904.		
January	19	... 20	January ...	23	... 24
February ...	19½	... 20½	February ...	23½	... 24
March	19¾	... 20¾	March	23	... 24½
April	20	... 21½	April	22¾	... 23¾
May	21	... 22	May	22½	... 23½
June	21½	... 22½	June	22¾	... 23¾
July	22	... 23½	July	23	... 24¼
August	22	... 23½	August	23¼	... 24¼

The output of wool from all States for the month of July, as compared with that during the corresponding period last year, is estimated by Dalgety & Co., Limited, as under:—

AUSTRALASIAN WOOL EXPORTS.

(From 1st July to 31st July.)

State.	1904. Bales.	1903. Bales.	Increase. Bales.	Decrease. Bales.	1902. Bales.
New South Wales ...	7,176	14,846	—	7,670	11,662
Victoria	1,632	3,144	—	1,512	2,746
South Australia ...	19	2,096	—	2,077	—
Queensland	2,227	1,083	1,144	—	216
New Zealand ...	10,342	13,226	—	2,884	15,929
	21,396	34,395	1,144	14,143	30,553

Decrease, 12,999 bales.

WOOL SALE FIXTURES.

Sydney—7th and 8th September
London—20th September
Sydney—20th, 21st, and 22nd Sept.
Adelaide—29th September
Brisbane—5th October
Melbourne—18th October
London—22nd November.

APPLE GROWING IN TASMANIA.

By J. KNIGHT, Victoria.

STOCKS USED AND THE TREATMENT OF THE TREES.

When attending the recent meetings of the Fruit Nomenclature Committee at Hobart last April, opportunity was afforded members for visiting the various fruit-growing districts, and in the course of the tour which was made every facility was given to see the methods of growing, packing, and shipping. Much may be learnt by a visit to the fruit growing districts there, as the practice differs materially from that adopted in Victoria.

The system of raising trees is not one that can be recommended; the old practice still exists of using seedlings as stocks, and, in many cases the stock has become so unsightly as to resemble the club or mallee root form. Beyond the slight saving in raising stocks, there seems no advantage in this over the Victorian system of blight proof stocks. Here and there trees may be seen growing which have been imported from this State, but, for some reason the advantages of a clean stock are not appreciated by growers, notwithstanding the freedom of the stock from blight. [The blight here referred to is the woolly aphis (*Schizoneura lanigera*), and in order to control this pest blight-proof stocks are exclusively used by West Australian apple-growers.—Ed.]

The first thing to strike a visitor on entering the orchards is the stunted character of the trees; this is not through any defect or want of skill in treatment, but is the result of a system deliberately adopted. In the first place the trees are planted much closer than here, with usually between 200 and 300 trees to the acre, at intervals of 12 to 15 feet. [The climate of Tasmania is cooler and certainly moister during the summer months as compared with ours in Western Australia, and it would therefore be sheer folly to try and grow the trees so close together in this State.—Ed.] And again, the training differs, as the trees are shaped to branch out near the surface, and have a dense coating of fruit-bearing spurs from ground to top, and it is claimed for this that the picking and gathering is much more easily accomplished, as it is done from the ground. The general appearance of the tree would remind one of Morgan's Seedling with its line of fruit from top to bottom, and, from a Victorian point of view, the fruit would be regarded as somewhat stunted or undersized.

With trees planted the distance given, in a climate such as exists there, one may expect a fair return, but I was not prepared to hear of what appeared to me as extraordinary yields. In some cases 700 to 800 bushels per acre were recorded, but 300 or 400 appears to be

about the average with most varieties. [A Tasmanian case is supposed to hold a bushel of apples.—Ed.]

An extensive list of varieties were formerly grown, but these are now limited to a few only, and among them are the Sturmer Pippin and the Scarlet Nonpareil. These two varieties are the principal ones now cultivated as they have been found to be specially adapted for the soil and climate.

SOME NATURAL ADVANTAGES.

Whatever disadvantages the fruitgrower may have through the rugged nature of his country, there is a wonderfully compensating condition which favours him. Throughout the whole of the fruitgrowing districts twining about among the hills there are navigable streams, and it is along the banks of these that the orchards are planted, and at various intervals small jetties may be seen running out in the stream from which the cases of fruit are delivered to the steamers and taken by them direct to the wharf at Hobart, where the mail boats and other large ships are enabled to come to the wharf and load. It is one of the sights of the country to see the enormous stacks of cases delivered there for shipment. During my stay in the city the *China* and *Aberdeen* were loading with 70,000 to 80,000 cases each. The work proceeds in a steady and careful manner, and it is quite clear that the shipping of apples is looked upon by steamship companies as a trade worth catering for.

PACKING THE FRUIT.

Along the river banks may be seen, here and there, large packing sheds. The fruit is brought in from the orchard fresh from the pickers, and packed by boys and girls on piece work and day work, the price usually paid being 1d. a case. Packers are supposed to reject any defective or undersized fruit, but when we see the system there of rushing the fruit in, it will be readily seen that grading does not receive much attention. A number of boys and girls pride themselves on being able to do their 100 cases a day on an average, but with some of the more careful shippers the number is limited to 50 or 60.

In passing through the packing sheds one cannot help regretting that more care is not exercised in keeping up the standard of quality. In most cases everything appears to give place to expedition in working; no doubt this is important where so many thousands of cases have to be prepared and shipped at a short notice. Stress is laid on the fact that their apples are picked, packed, and shipped fresh from the trees. To many the wisdom of this is questionable. Their season of maturing being later than ours no doubt contributes to this practice, as the shipping to the old world has to be completed in April or early in May. Their choice fruit cannot be gathered earlier. [In Western Australia the ripening season is, on an average, at least a fortnight earlier than it is in Tasmania, while another very important factor to our advantage is our closer

proximity to the European markets which can be reached fully a week earlier than it can by the Tasmanian growers. It follows, therefore, that our apple-growers will prove formidable rivals in the matter of exportation.—Ed.] The system to my mind emphasises the importance of our giving proper instruction in the general treatment of all export fruits. The necessity for inspection is clearly shown by the somewhat careless system of shippers in the Tasmanian trade, which must ultimately tell against them when competition with other States becomes more acute.

THE TASMANIAN CASE.

One of the great advantages which the Tasmanian apple shipper has, is in the nature of the cases in which he ships his fruit. While they do not look so well as those used in Victoria, they are nevertheless much better for protecting the fruit, as the timber is stronger and more rigid than the light wood cases made here. The cases are made in the packing sheds from the ready sawn timber, and 1d. each is paid for putting together and trimming. The total cost, delivered at the orchard, is from 5½d. to 6d., while in Melbourne it is 10½d. The mills cut and deliver the stuff at Hobart in the flat, in proper lengths, for 4d. and 4½d. a case, and there is no reason why a similar practice should not be adopted in this State. We have timber equally well adapted for the purpose, and facilities for obtaining the same, and a saving of 4d. or 5d. a case is well worthy of consideration by our orchardists. It is proposed to make enquiries at the mills when time permits, to see if this cannot be accomplished.

The keen competition which may be expected in the export of fruit necessitates economy at every point. I do not think that this State has anything to fear from competition, but every care should be taken to keep up the standard, as by that means only can we expect to succeed. In my opinion, Tasmania will require to alter her methods, which appear somewhat careless, the tendency is to go in for quantity rather than quality.

SYSTEM OF LOADING.

I was interested in the method of loading the fruit, and during my visit there I was fortunate in seeing two large vessels taking fruit on board. I could not help noticing the careful way in which the cases were handled; the cases of fruit are placed in barred slings and no pressure is brought to bear on the sides of the cases, as, unfortunately, is the case when loading here. Twelve cases are packed on two bars, the ropes are fastened to each end, and the weight of the cases is on the bars alone, but I am informed that the mail companies have a much more objectionable system and that the cases are placed in nets in large numbers, and a case was shown to me in which the sides were staved in by the pressure of the adjoining case, but the company still insist on loading in that form.

The only objectionable feature observed in loading the fruit was that, though the fruit was being lowered most carefully, the steve-

dores below trampled over the sides of the cases in travelling to and fro with a heavy case in their arms. There were no planks or other protection. They simply walked on the cases. No doubt this largely contributes to the occasional damage we hear of in reports of the condition of fruit when landed in London. A few planks laid down would obviate all this, and it is somewhat surprising that the shippers have not been able to secure such a needed reform. I think this is worthy of special attention, as the practice is carried on in this port, and with the soft woods such as ours the damage must be considerable.

METHOD OF MARKETING.

The export of fruit in Tasmania has been fostered chiefly by two firms in Hobart, which secure the space from the shipping companies, hence the shipments have to pass through their hands. Many of the sheds referred to along the banks of the rivers are owned by them, and the fruit is purchased direct from the growers, and packed and shipped by these firms. During the last two years, however, outside boats have been seeking a share of the trade, and a few of the large growers have shipped direct, and the hope is freely expressed that this system will soon become general.

PRICES REALISED.

The price realised by the grower at the packing sheds during the last year or two has been 3s. a case, which is regarded as being quite satisfactory, but there are many instances in which the grower provides the case and paper, besides packing and delivering at the wharf at Hobart. With these the grower is provided with his own sheds, and, as a rule, the packing is more carefully done as the work is supervised by the grower, or done with the aid of his family, a system now becoming more general. Under these conditions 4s. per case is paid for the best shipping varieties. In some instances the firms referred to ship for the grower at a charge, by way of commission, of 3d. a case.

EXTENT OF THE TRADE AND PROBABLE EXPANSION.

At the time of my leaving 500,000 cases had been shipped, and it was considered that there would be about 800 cases additional before the close of the season, which would extend to the end of April. This, however, by no means covers all shipments from Tasmania, as heavy consignments are sent to inter-State markets and elsewhere, and it is estimated that over a million bushels would be available for shipment after the English market had closed.

In driving through the various districts one is struck with the enormous increase in the area planted. In all directions newly planted orchards may be seen, and extensive areas being prepared for the reception of trees, but as before stated, planting is limited to

the valleys; the hills and back country being regarded as unsuitable.

FREEDOM FROM PESTS.

The freedom from pests, insect or fungus, shows the great advantage the Tasmanian growers possess over those in this and other States. It is claimed by them that disease has been stamped out. If such is the case, there is a prospect of our own product being considerably improved, but I am under the impression that their climatic conditions are not so favourable for its development as here. As in the case of codlin moth, there it is understood that one brood only in the year is produced, whilst here, it is found necessary to protect the fruit, by spraying, from setting to gathering. As to black spot, which gives such trouble here, there is not much to be seen anywhere through the orchards, and spraying is but little resorted to. Scale shows itself here and there, but that also is kept well in hand.

BYE-PRODUCTS OF THE ORCHARD.

I may say I am somewhat disappointed in finding the want of energy amongst the Tasmanian orchardists in the way of not utilising what may be termed their waste product. The heavy loss sustained annually in this respect is considerable. Hundreds of tons are simply wasted, with little or no attempt to make use of them.

I visited two factories in which drying was attempted, and have no hesitation in saying that if proper care was bestowed in this line alone a considerable increase in the returns to the orchardist might be made. I also visited a cider making establishment, which is carried on in a limited scale, and in this also there is room for improvement. If the outlet for this class of product were properly attended to it would result in immense benefit to the orchardists of that State.

As to fruit vinegar, I was unable to find any attempt being made to supply this to the trade. In one or two instances I was informed it was made in the home for domestic use, but there was no attempt to develop a trade. These minor outlets are worthy of consideration from our own orchardists, and those contemplating entering into the business may rest assured that they have nothing to learn or fear by way of competition from the neighbours across the Straits.

POWDERED BORDEAUX MIXTURE.

Of all fungicide sprays, Bordeaux mixture is the one more generally used. Its preparation offers no difficulty, and yet some care needs to be taken to prepare it so that the light insoluble copper salt will remain in suspension in the liquid instead of precipitating at the bottom of the vessel.

The fruit-grower, on the other hand, often unknowingly has inferior grades of sulphate of copper foisted on to him, whilst also a good quicklime, fairly free from sand, is not easily procurable. The amount of sand our lime contains, although immaterial for the use of the builder, weakens its virtue when chemically associated with such a substance as sulphate of copper, and scratches by its mechanical action the vital parts of the spray pumps. It is, therefore, with satisfaction that we are able to direct the attention of fruit-growers and gardeners to a form of Bordeaux Mixture in the powder state which Messrs. Wm. Sandover & Co. have submitted to Mr. Despeissis, the Horticulturist of the Department, for examination.

The powder, which is stocked under the trade name of "Strawsonite," is light blue in colour and almost impalpable to the touch. It readily mixes with water. For summer spraying, ¼lb. of the powder for a gallon of water is a suitable strength, which, while causing no accident to the foliage of plants, will help in effecting the cure expected from its application. The dose may be strengthened for winter spraying.

Being in a convenient form for storing, the mixture can be used at any time and without the least trouble. Sufficient only for the day's spraying should be mixed, and it is not advisable to allow the diluted mixture to stand long before using.

As the spraying season is now on, and as attention is being called to a form of Bordeaux mixture which for several seasons past has been used with good results in Western Australia as well as in many other fruit-growing countries, the following information on the subject, borrowed from our exchange file, will prove of interest.

BORDEAUX POWDER FOR DUST SPRAYING.

Owing to the attention which has been lately directed to the possibility of using Bordeaux mixture in the dry form, it has been considered advisable to place before local growers what is probably the best form of making this powder. The process has been devised by R. M. Bird, Chemist to the Missouri Agricultural Experiment Station, U.S.A.

The materials required to make about seventy pounds of a stock powder, which can readily be made up to a strength equivalent to the ordinary 6·4·40 liquid Bordeaux, are as follows :—

Bluestone	6lbs.
Quicklime	4lbs.
Water to dissolve bluestone	2 gals.
Water to slake lime	2 gals.
Air slaked lime, sieved	60lbs.

A box about 3 × 3 × 3 feet is required with which the material is sifted. A wire sieve with 25 or 30 meshes to the inch should be made to fit the top of the box, and should be provided with a cover to prevent the lime dust from escaping. Another sieve, but with 100 meshes to the inch, is also needed.

A wooden block made of a flat piece of 1 inch or 1½ inch stuff, about 12 inches square, with a handle at right angles to the surface of the flat piece of wood, will help to rub the material through the sieve.

Two closely woven *cotton* flour bags, one slipped inside the other, are needed to filter the blue material.

Directions for Making.

1. Break up into small lumps about 70 or 80lbs. of quicklime, and spread it out so that it will become air slaked. When slaked and perfectly dry sift it through the fine sieve (100 meshes).

2. Dissolve 6lbs. of bluestone in 2 gallons of water.

3. Slake 4lbs. of good quicklime so as to get a fine powder, and make up two gallons of milk of lime and allow to cool.

4. Put 60lbs. of the *sifted air-slaked* lime into a shallow box, one in which the material can be thoroughly worked with a hoe or shovel.

5. Pour the well stirred milk of lime and the bluestone solution *at the same time* into a third vessel, and stir well until the whole is perfectly mixed, when it will have a deep blue colour and be thick.

6. Pour *immediately* into the double flour bag and squeeze out most of the water.

7. Empty *at once* (it must not be allowed to dry) this wet blue material into the 60lbs. of air slaked lime and work it up so that it will be well distributed. If the resulting mixture is too moist add more air slaked lime.

8. Rub the mixture through the *coarse* sieve while *still somewhat damp*, mix thoroughly and spread out to dry.

9. When perfectly dry sift it through the *fine* sieve, crushing all lumps. All of this can be readily made to go through the sieve except the small amount of sand which may be in 4lbs. of quicklime. Mix so that the blue copper compound will be perfectly evenly distributed throughout the whole mass.

This stock powder will keep indefinitely. For use add 130lbs. of slaked lime (or an equal *volume* of flour) to the stock powder, and the resulting mixture will be practically of the same strength as the 6·4·40 Bordeaux. Paris green may be added in the usual proportion if required. It need hardly be said that a proper dust sprayer is needed for making the application.

BLACK SPOT OF THE VINE.

The following method of treatment, which has been well tried in Europe and elsewhere, is recommended for black spot of the vine:—

Winter Wash.

Sulphuric Acid	1lb.
Water	10lbs. (1 gallon)

Add the acid to the water, using wooden vessels. This solution should be brushed over the parts of the vine above ground before any sign of growth is noticed. A mop of hog's bristles or horse-hair is useful for applying this material, and care should be taken not to splash it over one's clothes or hands.

When acid is bought in quantity it is sometimes difficult to ascertain the weight of small quantites. The ordinary reputed quart wine or whisky bottle holds one-sixth of a gallon, that is three pounds of acid, so a convenient measure can be made from one of these bottles by marking it off into three equal parts, each of which will represent the pound of acid to add to one gallon of water.

Spray for Use in the Spring.

When the buds are beginning to expand, the vines should in addition be sprayed with Bordeaux mixture 6·4·40, if there is reason to suspect serious trouble, or if last season the disease was prevalent.

Bluestone	6lbs.
Quicklime	4lbs.
Water	40 gals.

Dissolve the bluestone in 20 gallons of water in a tub or cask, and slake the lime gradually, so as to obtain a fine smooth paste free from lumps. Add 20 gallons water to the lime so as to make what is called milk of lime, and then run both bluestone solution and milk of lime evenly together into another barrel or into a spray pump, using a strainer over it to keep out any lumps. Stir thoroughly and use same day.

Instead of the Bordeaux Copper-soda may be used. It is made in the same way as Bordeaux, except that the 4lbs. of lime is replaced by 9lbs. of washing soda.

Bluestone	6lbs.
Washing soda	9lbs.
Water	40 gallons.

Both the Bordeaux and the Copper-soda may be used for spraying trees as well as vines to prevent the attack of various fungus diseases. The quantity of water may in cases be increased to 50 gallons.

FERTILISERS FOR MARKET GARDEN CROPS.

Being a reprint of Leaflet No. 106 of the Board of Agriculture of Great Britain.

Concentrated fertilisers are used by market gardeners to an increasing extent, but many growers still rely wholly on town dung.

Market gardeners often apply 25 tons of town dung per acre at one time, and sometimes even 50 tons per acre. This is very expensive, for, although the cost varies according to locality and facilities for transit, town dung probably costs, on an average, when all charges are paid, nearly 7s. per ton weight, and in many cases more.

Town dung is poor in quality as compared with cake-fed farmyard dung. Its value depends largely on its organic matter, which, in the case of light and sandy soils, helps to retain moisture in dry weather, while in the case of stiff clay soils it prevents baking and keeps the soil open and spongy.

It is probable, however, that except on very light and open soils the merely mechanical or physical effects of town dung might be sufficiently obtained from the use of smaller quantities than are commonly used, while for many crops its use may be economically intermitted.

This view is supported by experiments carried on during the last 10 years on a variety of vegetable and fruit crops on a weald clay farm in the neighbourhood of Hadlow, near Tonbridge, Kent. From these experiments (fully described in the "Journal of the Board of Agriculture" for March, 1903), it appears that, in the case of most vegetables, town dung alone will not give maximum crops unless very large quantities are used; and that the cost of such heavy dunging is greater than would suffice to produce the same result if less dung were used, supplemented by chemical or concentrated fertilisers.

The following general recommendations for the manuring of market garden crops are based mainly on the results of these experiments.

It must be understood that by "dung" is meant throughout, not farmyard dung, but ordinary town dung. The dressing of about $12\frac{1}{2}$ tons per acre, frequently mentioned in the following pages, is equivalent to 25 small cartloads of town dung in a fresh, loose condition.

The recommendations given are for heavy land, or loams of fair or "medium" consistency. On decidedly light and freely-draining soils, 2cwt. of the total nitrate of soda prescribed may be replaced by about 3cwt. rape meal, or 5cwt. of fish guano applied before sowing or planting, at the same time as the phosphates and potash salts.

CAULIFLOWERS AND BROCCOLI.

A light dressing of town dung ($12\frac{1}{2}$ tons per acre) may be recommended, with from 4 to 6cwt. of superphosphate, 4cwt. of kainit, and 4cwt. of nitrate of soda per acre; the nitrate of soda being divided into two dressings. A good crop, however, may be grown without dung by using 6cwt. of superphosphate, 4cwt. of kainit, and 6cwt. of nitrate of soda per acre; the last named being divided into two or three dressings.

AUTUMN CABBAGES AND SAVOYS.

A dressing may be recommended of $12\frac{1}{2}$ tons of town dung, with 6cwt. of superphosphate per acre, 6cwt. of nitrate of soda per acre being used as a top-dressing for autumn cabbages, or 4cwt. for savoys; one-half of the nitrate being applied at the time of planting, and the remainder a month or two later. If dung cannot be spared, the quantity of nitrate of soda may be increased to 8cwt. per acre for autumn cabbages, or 6cwt. per acre for savoys.

SPRING CABBAGES.

By spring cabbages is meant the crop planted in autumn and harvested in spring. These are usually dunged, but as they are not so subject to drought as spring-planted crops, they may be planted without further dung than the residue left in the land from that applied to the previous crop. They should, however, at the time of planting, receive a dressing of 6cwt. of superphosphate per acre. Nitrate of soda at the rate of not less than 4cwt. per acre may be applied during the spring, divided into two dressings; but the quantity of nitrate may be advantageously increased to 6cwt., and in some seasons to 8cwt., per acre.

BRUSSELS SPROUTS.

These, on soils of fair consistency, may be readily and economically grown without dung, provided that concentrated fertilisers are liberally used. A good dressing is 6cwt. of superphosphate and 4cwt. of kainit per acre, applied just before planting; from 4 to 6cwt. of nitrate of soda being afterwards used as a top-dressing, divided into two applications a few weeks apart.

On very light sandy soils that suffer easily from drought, however, some dung should also be given.

WINTER LETTUCES.

Winter lettuces may be grown without fresh dung on ground dunged for the preceding crop. Experience indicates that if a grower has used anything like 25 tons of dung per acre for the last crop, whatever it may have been, he may safely plant winter lettuces on the same land without any further manuring. If, however, he plants winter lettuces in succession to a crop that has been only moderately dunged, he may give about 4cwt. of superphosphate and 2cwt. of nitrate of soda per acre—the latter, of course, being applied during the spring.

SUMMER LETTUCES.

Summer lettuces, however, should not be left without dung lest they may suffer from drought early in the season. A light dressing of dung, with from 4 to 6cwt. of superphosphate per acre, should be applied before planting, and 2cwt. of nitrate of soda per acre applied as a top-dressing.

Summer lettuces grown thus do not appear to need any special application of potash.

CARROTS AND PARSNIPS.

Most market gardeners probably do not dung carrots or parsnips, but grow them on land dunged for the preceding crop.

If a grower has used as much as 25 tons of dung per acre for the previous crop, it will probably pay best to plant carrots or parsnips without further manuring. But following only a moderate quantity of dung for the last crop, he should give carrots or parsnips from 4 to 6cwt. of superphosphate and 1cwt. of sulphate of potash per acre, followed by a top-dressing of 2cwt. of nitrate of soda per acre after the plant is well up. In the case of carrots, a further dressing of 2cwt. of nitrate per acre may in some seasons be given with advantage a month later.

Potash salts should on no account be omitted for either carrots or parsnips.

SUMMER SPINACH.

A light dressing ($12\frac{1}{2}$ tons per acre) of dung may be recommended on heavy or medium land, with from 4 to 6cwt. of superphosphate and from 4 to 6cwt. of nitrate of soda per acre—the nitrate applied in dressings of 2cwt. per acre each.

In a good season, especially on land recently dunged for another crop, a good crop of spinach can be raised without any fresh dung if the phosphates and nitrate of soda are supplemented by 4cwt. of kainit or 1cwt. of sulphate of potash per acre; but the combination of dung and concentrated fertilisers is probably safer.

WINTER SPINACH.

Winter spinach has been grown successfully after the removal of the summer spinach, without extra manuring, on heavy land. On light land it might be desirable to give a further top-dressing of 2cwt. per acre of *nitrate of soda—without, however, repeating the* application of dung or superphosphate.

BEETROOTS.

A light dressing of dung is desirable, with from 4 to 6cwt. of superphosphate and 4cwt. of nitrate of soda per acre, 2cwt. of the nitrate being applied shortly after the plant is up and a further 2cwt. a month or so later. If no dung is used, 4cwt. of kainit or 1cwt. of sulphate of potash per acre should be sown before the preparation of the seed-bed, and in such case also a third top-dressing of 2cwt. of nitrate per acre may be given. On most soils, however, the application of a moderate quantity of dung is valuable for securing a plant if the season should prove dry.

Potash appears not to be necessary when dung is used.

RHUBARB.

A light dressing of town dung is recommended ($12\frac{1}{2}$ tons per acre), and from 4 to 6cwt. of superphosphate per acre, with 2cwt. of nitrate of soda per acre for small varieties, or 4cwt. for large varieties. Sulphate of potash (1cwt. per acre) or kainit (4cwt. per acre) has proved useful for small varieties, and will possibly benefit the coarser varieties on some soils.

Rhubarb grown with a combination of dung and concentrated fertilisers grows more rapidly, and is more tender and less stringy than that grown with dung alone.

POTATOES.

For early potatoes, on soils so heavy as that of Hadlow, 25 tons of dung per acre have consistently proved more economical than a lighter dressing, even when the latter is liberally supplemented by concentrated fertilisers. Early potatoes are very dependent upon rain, and summer rain has on the average been scarce during the seasons of experiment.

For late potatoes the best results at Hadlow have been obtained from light dung, phosphates (say 4 to 6cwt. of superphosphate per acre), 1cwt. of sulphate of potash, and 4cwt. of nitrate of soda per acre, the nitrate being applied in two dressings.

In the presence of dung potash has produced little effect on the early potatoes, but much on the late varieties.

On light soils 2cwt. of the nitrate of soda might be replaced by 2cwt. of sulphate of ammonia (applied before planting) for the early varieties, or by 8cwt. of rape meal, or 5cwt. of fish guano for the late varieties; 2cwt. of nitrate of soda per acre being applied as a top-dressing.

SPRING OR SUMMER ONIONS.

With regard to this crop, the experience at Hadlow is too limited to yield definite recommendations, for in some years the plant failed owing to drought or wireworm. A light dressing of dung, supplemented by 4 to 6cwt. of superphosphate, 1cwt. of sulphate of potash (or 4cwt. of kainit), and 4cwt. of nitrate of soda per acre may, however, be regarded as a safe dressing.

Potash appears to be of vital importance to onions, and should on no account be omitted.

ASPARAGUS.

Excellent results may be obtained by the use of a light annual dressing of town dung (say 12½ tons per acre), 4 to 6cwt. of superphosphate, 4cwt. of kainit, and from 2 to 4cwt. of nitrate of soda per acre. Asparagus thus grown has been found to develop more rapidly than when heavy quantities of dung are used without concentrated fertilisers, and the produce has been more tender and succulent, and of better flavour, on the "combination" plots than where dung alone was used.

DWARF FRENCH BEANS.

These may be grown with a light dressing of dung, from 4 to 6cwt. of superphosphate, and 1cwt. of sulphate of potash (or 4cwt. of kainit) per acre. The use of 2cwt. of nitrate of soda per acre has in three seasons given a very substantial advantage, increasing the average weight of beans gathered from less than 3¼ tons per acre to over 4½ tons—an advantage of nearly 50 per cent.

GREEN PEAS.

In the case of green peas, as far as mere weight is concerned, no substantial advantage has so far been found to arise from the use of nitrate of soda, a good crop being grown from a light dressing of dung with a dressing of phosphates and potash salts. The quality, however, of the peas has been improved by the addition of 2cwt. of nitrate per acre, both as regards colour, texture, and taste.

GLOBE OR THISTLE-HEADED ARTICHOKES.

The results of five years' cropping on the same plantation showed that a combination of concentrated fertilisers and light dung gives much better results than heavy dung. Probably the best dressing is about 12½ tons of town dung, 6cwt. of superphosphate, 1cwt. of sulphate of potash (or 4cwt. of kainit), and from 2 to 4cwt. of nitrate of soda per acre. This combination gives on the average a much earlier crop of heads than where dung only is used. This is important to growers who supply the London markets, for artichokes grown in the early part of the season are more easily marketable.

JERUSALEM ARTICHOKES.

For this crop the same recommendations may be followed as have been made for winter lettuces.

CELERY.

Celery, except on soils particularly well adapted to its cultivation, cannot, probably, be grown with any great success without the use of very much larger quantities of dung than are necessary for other crops. The dung should be placed in the trenches, together with a dressing of phosphatic manure. The crop may, during its growth, be occasionally top-dressed with nitrate of soda.

The use of the concentrated fertilisers may not much increase the crop, but will tend to make the celery more crisp and tender than that grown by the use of dung alone.

STRAWBERRIES.

Although the strawberry plant contains a good deal of potash, the direct application of potash salts appears to be deleterious rather than otherwise to the yield. The best general treatment is probably a light annual dressing (about 12 tons per acre) of town dung, with from 4 to 6cwt. of superphosphate and 2cwt. of nitrate of soda per acre.

GOOSEBERRIES.

A light dressing of dung (about 12 tons per acre) with 6cwt. of superphosphate, 1cwt. of sulphate of potash, and 4cwt. of nitrate of soda per acre has given much better results with gooseberries than heavier dressings of town dung without concentrated fertilisers.

Potash appears to be a very essential ingredient of a successful gooseberry manure. The crop of gooseberries at Hadlow, over three years, was, on the potash-dressed plots, not far short of double that on the plots which received no potash.

If nitrate of soda be used as the sole nitrogenous addition to dung, not less than 4cwt. per acre should be applied.

NOTE AS TO SUPERPHOSPHATE.

In the foregoing notes superphosphate has been recommended throughout. This is on the assumption that the soil to be manured contains a sufficiency of lime, that is to say, sufficient carbonate of lime to cause effervescence when a mineral acid is poured on it. On land poor in lime the place of superphosphate should be taken by a considerably larger weight of basic slag, or of Peruvian guano, or of fine bonemeal, or of a mixture of superphosphate and bonemeal, or of that form of precipitated phosphate which is now to be obtained under the name of "basic superphosphate"; or at any rate the use of one or other of these manures should be alternated every other year with that of superphosphate.

OTHER CONCENTRATED FERTILISERS.

If, in addition to nitrate of soda, other concentrated nitrogenous fertilisers are used, such as sulphate of ammonia, fish guano, dried blood, rape dust, etc., these should be put on earlier than the nitrate of soda; and in this case the quantity of nitrate would be decreased. It must be remembered, however, that the nitrogen in nitrate of soda is immediately available for plant use, and that the nitrogen in 1cwt. of nitrate of soda goes farther, for the immediate crop, than the same quantity of nitrogen in the form of fish guano or rape dust or dried blood, or even (except in a wet season) of sulphate of ammonia. In fact, the choice between nitrate of soda and sulphate of ammonia, and their proportion to any other nitrogenous fertilisers used, is to be determined in individual cases by circumstances of soil, climate, and cost.

COST OF MANURING.

As a rule the concentrated fertilisers recommended in the foregoing pages will cost about £3 10s. per acre for heavy or medium land, or about £4 for light land. If town dung be taken at 7s. to 8s. per ton, the combination of 12½ tons of dung and the concentrated fertilisers will come to between £8 and £9 per acre. Sufficient town dung to give as good a yield as the mixed dressings would probably cost £15.

Many market garden crops, however, can be well grown (except on very light or dry land) with chemical fertilisers alone at a cost of £3 10s. or so per acre, following some other crop that has been already dunged.

THE SWEET POTATO

(*Ipomoea batatus*), Syn. (*Batatus edulis*).

GEO. L. SUTTON, Experimentalist, H. A. College.*

The following article on the cultivation of the sweet potato has been taken from the *Agricultural Journal* of N.S.W. This very useful and highly nutritious vegetable can be grown to perfection in almost any part of this State. Enormous yields have been obtained from sandy patches around Perth. As this is the season for planting, those who have not already tried them should do so.

"The sweet potato is not cultivated in this State as it deserves to be, or as extensively as our climatic conditions will allow. At present its cultivation is confined almost to the thin fringe of

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coastal area. In the sweet potato we have a crop which will probably, on trial, be found suitable for many of our hot and somewhat dry districts, and prove a welcome addition to the list of vegetables which it is possible, without irrigation, to grow in them.

"Its range of suitability has by no means been determined; in fact, its determination has hardly been commenced. If proper care be taken with regard to the raising of the 'plants,' and the selection of varieties, many districts hitherto regarded as totally unsuitable will, I am sure, be found to suit this crop. Queanbeyan is not usually regarded as a sweet potato district, yet in 1903 Mr. Farrer successfully grew several varieties. At Howlong, Mr. Ellis, of the Viticultural Station, grows sweet potatoes to perfection.

"With us this crop has proved a splendid drought-resister. If a little attention be devoted to keeping down weeds and conserving moisture by hoeing—hand or horse—it is surprising how much dry weather the sweet potato will resist; and as for heat, some of the varieties simply revel in it.

"SOIL REQUIRED.

"The ideal soil for this crop is a sandy one, well supplied with organic matter. In a soil of this character the plants possess almost all the hardiness of weeds, the roots develop well, being even in quality and of good shape. Light loams are also very suitable, but the more clayey a soil is, the more unsuitable it is. Fair yields —two to three tons per acre—have been obtained on our stubborn pipeclay, but soil of this description is unsatisfactory; it requires the maximum of labour for the minimum result. The roots are also poor in quality and ill-shaped. On the other hand, in our sandy soil, poor though it is, four, five, and six tons per acre are obtained with but little trouble.

"PREPARATION OF THE SOIL.

"Usually two ploughings are considered necessary to prepare the soil for this crop. The first is done during the winter or early spring, but sufficiently early to allow the soil to settle and become compact before planting. It will then be in a suitable condition for the young plants to utilise the moisture in subsoil, should it be required. This first ploughing can be as deep as the soil will admit without bringing the sour subsoil to the surface. The second ploughing, on soils at all light, should be only shallow—say, about four inches—so that the sole made by the plough will offer some resistance to the development, lengthways, of the roots. Unless this precaution be taken, the roots on sandy soils are apt to become excessively long and thin, rather than chunky, which latter characteristic is to be desired. It must, however, be admitted that some varieties, notably 'Pierson,' are not as bad in this respect as others.

"MANURING.

"If the roots are intended to be used as a vegetable, the direct application of farmyard manure to this crop is not recommended.

Whilst stable manure improves the yield both of vine and roots, it is at the expense of quality in the latter.

"If plenty of farmyard manure be available, it is a good plan to apply it to the crop preceding the sweet potatoes.

"Our practice here, and one attended with excellent results, is to maintain the supply of organic matter in the soil by the system of cropping adopted, and to use the following mixture of fertiliser:—

Superphosphate	4 parts.
Sulphate of potash	1 part.

"This is applied at the rate of 3cwt. per acre in the drill when the plants are set out. In cool districts it is likely that the application of 25 to 50lb. of nitrate of soda in addition to the above mixture will be found beneficial.

"PROPAGATION.

"From the remarks made by visitors, I feel sure that many failures with this crop have arisen through planting in a similar manner to that adopted with the ordinary potato—*i.e.*, using the roots whole or cut as sets. Whilst this practice will produce a crop, though somewhat late, in our North Coast or long-season districts, yet in short-season or a dry district, to adopt such a practice is to court failure at the outset.*

"This crop is best propagated by means of shoots or 'plants' which grow from the sweet potato. When bedded or planted, sometimes as many as fifty 'plants' will grow from a single small root, and two or three pullings may be obtained in a single season.

"HOW TO RAISE 'PLANTS.'

"The plants necessary for producing an early crop are obtained by placing the roots—kept over for this purpose from the previous season—on sand in a cold frame or hot bed. The sweet potatoes are placed close together, but not touching each other. They are then covered with two or three inches of sand (river sand preferred); the whole bed is then well watered and covered with a glass sash or frame of hessian. By raising a corner of the frame, enough air is admitted to prevent rot setting in. The bed should be kept moist, but not wet, and covered until the plants show through the sand. The covering is then removed during the day-time but replaced at night. This is done until all danger of frost is past. The 'plants' when six or eight inches long are ready for planting out.

"By bedding the roots early, the addition of bottom heat is unnecessary in a district as warm as the Hawkesbury. We bed down about the end of July or beginning of August, and always

* In many districts the root-gall infests sweet potato crops, and might easily and unconsciously be introduced to clean land by a practice of setting tubers in the field. Where propagation is from cuttings, and the old roots and seed-bed can be well limed or burned by fires on the surface, the risk does not exist.—ED.

have plants ready as early as it is safe to put them out. Plants raised on sand, and without artificial heat, are hardier than if raised in a rich compost and on a hot bed, and in addition the risk of introducing disease is lessened. In a cold district, or where bedding-down has been delayed, it will probably be found necessary to use some sort of bottom heat.

"For raising early plants, a cold frame, covered with a sash of glass, has given us the most satisfactory results; but where glass is not available, hessian or bagging may be used to retain heat and keep off frosts. It gives good results, but in the end is the more expensive, as it requires renewing each year, whilst glass, with care, lasts indefinitely. One or two potatoes, bedded in a small box or kerosene tin, if placed in a sunny situation, and covered at night, will supply sufficient plants for a kitchen garden.

"In this district, plants quite early enough for a main crop can be obtained by bedding the roots in the open ground in a sheltered situation with an easterly aspect, or cuttings six or eight inches long may be made from the vines of the early-planted crop and set out in the same way as the plants obtained by bedding. These cuttings will grow quite readily. The crop produced by planting them seems to keep better than the early crop. Small roots are the best for producing plants. One cwt. will produce at one 'pulling' 4,000 to 5,000 plants, and will occupy 90 to 100 superficial feet.

"Raising Roots specially for Bedding Purposes.

"Though small roots are the best to use for bedding purposes, it is poor policy to use the small ones or culls from the main crop for this purpose. Prof. Massey, of the North Carolina Experiment Station, some years ago advocated the growing of a crop of small roots specially for bedding purposes. Some four years ago we adopted this plan with very satisfactory results. The method recommended by Prof. Massey and adopted by us is as follows:—

"Cuttings 12 to 15 inches long are taken from the growing vine, and after being rolled around the hand are planted in the usual way, with just the tip showing. This planting is done here about the middle of January. Almost every joint of the buried vine produces a cluster of potatoes. The result is a large number of small roots, the best of which are selected and are just the right size for bedding.

"When to Plant.

"The planting is commenced at any time when all danger of frost is past. It can be continued in this district right up to the beginning of January with every hope of a good crop.

"How to Plant.

"The shoots or plants six or eight inches long are carefully drawn from the bed, and are set root downwards in a bucket of

water or a mixture of cow-dung and water. They are then taken to where they are to be grown. They are drawn from the bucket as required, and placed, with the roots dripping, two feet apart in rows which are three feet apart.

"The plants may be ploughed in at the time the ground is getting its second or final ploughing. When this method is adopted, the plants are placed the required distance apart in every third or fourth furrow, the necessary covering being given by the plough as it turns the succeeding furrow.

"The common plan here is to thoroughly prepare the ground first and then dibble the plants in with a spade. This plan is somewhat slower than ploughing in, but for our conditions it has been proved the most satisfactory. A man and a boy can plant with a spade 3,500 plants in eight hours.

"A point of very great importance when planting by either method is to see that the soil is thoroughly compacted around the plant. This is especially necessary in dry weather. When the plants are dibbled this compacting is done by the man pressing the soil *firmly* against the plant with his foot. When ploughed in, a heavy roller with a large diameter should follow the planting. A roller with a small diameter will drag the plants up. Whatever method of planting is adopted, if the ground be at all moist the plants will root without difficulty.

"RIDGE PLANTING.

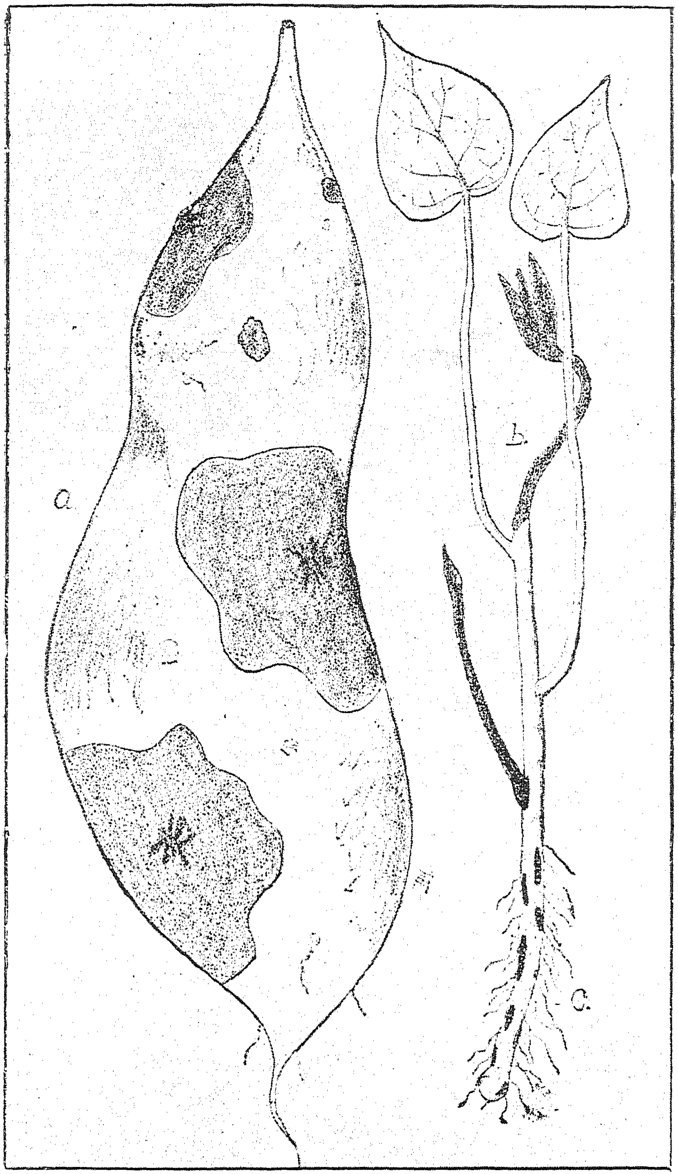
"It is the practice of some growers to plant on ridges. In cold districts this is probably beneficial, but here satisfactory results have always been obtained without the trouble and expense of ridging. Though I have not seen the results of any experiments conducted to throw light on this question, I am inclined to think, from observations on the results of this practice on other crops, that ridging is neither beneficial nor necessary.

"AFTER-CULTIVATION.

"The subsequent cultivation given to this crop is such as will keep the weeds down and conserve moisture. Cultivation with a small toothed scuffler may commence as soon as the plants are set out, and can be continued until the vines cover the ground. Other than disturbing the vines whilst cultivating, no attempt is made to prevent them rooting where they touch the ground.

"WHEN MATURE.

"Plants set out early in October should produce roots fit for the table by the end of December. This time, however, will be determined by the nature of the season. We have had sweet potatoes fit to eat by the 19th December, but this year, owing to the low sun heat, our earliest potatoes were not ready until the middle of January.



Black Rot.

a, diseased tuber : *b*, tip of *c*, diseased sprout ; base of diseased sprout. (After Halsted.)
(See page 214.)

"The mature stage can be determined by cutting one of the potatoes. If the cut surface dries white and does not turn greenish-black round the edge, the potato is fit to eat. If a milky juice exudes which, on exposure to the air, turns black, the potato is not mature enough.

"The potatoes will continue to grow until the first frost is experienced; this destroys the vines, and, of course, the roots will cease to grow after this. The crop may be left in the ground until then, and if the frosts are not very severe, they may be left until they are required, but the vines should be removed, or when they decay they will communicate rot to the roots.

"HARVESTING.

"The harvesting is usually done by hand labour. Some diggers prefer to use a pronged hoe, others a digging fork; it is a question of use. With some varieties which produce their roots in clusters around the 'plant' the labour of digging may be lessened by throwing a furrow away from each side of the potatoes.

"When digging, care should be taken not to bruise the roots; a bruised potato rots easily, though a clean-cut one keeps well.

"STORING.

"No difficulty has been experienced in keeping small quantities in dry sand. The potatoes on being dug are allowed to dry in the sun for a few hours, and are then placed away in sand, and keep through the winter perfectly.

"In America large quantities are kept through the winter by storing. In mild climates they are stored in conical heaps under a shed. A thick layer of straw is placed on the ground, the potatoes, about 15cwt., are piled on this straw and then covered with the same material; they are allowed to remain like this for a few days, until the sweating period is over. After this the whole heap is covered with several inches of earth. In cold climates the method of storing is somewhat similar, but specially constructed buildings are necessary so that an even temperature can be maintained.

"AS A STOCK FOOD.

"In addition to the value of the roots as a vegetable they are also a valuable stock food, and the vines make an excellent cattle food. The roots have a slightly higher feeding value than common potatoes, but like them are fat, heat, and energy-producing rather than flesh-forming. Pigs are very fond of the succulent roots, and can harvest them without difficulty or assistance. It is said they keep the kidneys and bowels in good order, and so ward off disease.

"VERSUS MAIZE.

"Pig farmers who have poor sandy land would do well to consider the advisability of raising this crop extensively in place of maize for fattening.

"It is estimated that it requires 4½ bushels of sweet potatoes to equal one bushel of maize grain in feeding value. But much sandy soil which does not produce one ton of maize could be made, with little trouble, to produce five or six tons of sweet potatoes.

"DISEASES AND PESTS.

"So far this crop has not shown itself susceptible to many diseases or pests. Very little trouble has been experienced with diseases here. It is possible this is due as much to the hardy varieties grown as to the inherent qualities of the plant to resist disease. One or two roots in an acre may be found to be affected with rot in a season, but certainly not more.

"In January, 1903, a plague of caterpillars attacked the vines; some of them grew to an immense size through feeding on the leaves. They completely denuded a strip of leaves and stems, but a single application of Paris green destroyed them, when the plants threw out fresh leaves and seemed none the worse for the attack.

[The Sweet Potato is attacked by several fungus diseases. The most important of these is the Black Rot Fungus *Ceratocystis Fimbriata*. The accompanying illustrations show a tuber attacked by this disease. It attacks the plant at any time of its existence even after being stored. The black spot is at first very small, gradually increasing in size until the whole tuber is destroyed. Owing to the nature of this disease, it is important that every precaution should be used to prevent it obtaining a footing. For this reason no diseased tubers should be used in obtaining shoots, young plants should be selected with great caution and diseased or suspicious tubers destroyed. Should any signs of the disease appear, the plant should be immediately sprayed with Bordeaux mixture, which will prevent the development of the spores. All diseased plants should be burned, so that the spores of the disease do not remain in the soil. Do not plant in the same ground as a previous crop has been in, but carry out a system of rotation of crops and thereby prevent the spread of disease.—Ed. *Journal.*]

"VARIETIES.

"There are some 14 varieties in cultivation, but only two, viz., White Maltese and the Red Table, have been grown to any great extent in New South Wales.

"Early in 1902 the Hon. the Minister for Agriculture had six of the best American varieties imported into this State with a view of testing their suitability for our climate and to encourage the growth of this neglected crop. A comparative trial of these varieties was made here last year, the results of which are almost ready, and will be published in next issue."

(To be continued.)

MANAGEMENT OF FOWLS.

HOW ONE FLOCK WAS MADE TO MAKE A FINE RECORD.

HANS VOGELSANG, in *Montreal Herald and Star.*

In your issue of January 13th, I noticed a letter from a poultry keeper who claimed that he got over 7,000 eggs from 59 hens during ten months. This is very good and much better than many others who keep hens receive, but it is nothing extraordinary. Last fall I wrote a letter to your department, stating that I got 7,500 eggs from 50 hens. Last year I had 70 hens, and from them received 11,510 eggs, or over 164 eggs from each hen; during 10 months they averaged 160 eggs a piece; during the first six months they averaged 112 eggs. I have pure-bred S. C. B. Leghorns, almost perfect in colour and shape, that will lay 250 eggs a year. S. C. B. Leghorns are my favourites. I also have fine black Minorcas, white Leghorns, and B. P. Rocks, but the B. Leghorns are the best layers. My hens have everything they need. In the morning they get a warm mash, consisting of potatoes, bran, and shorts, and twice a week finely-cut boiled beef or green bone mixed with it. Of that food they get no more than they can eat up clean in five minutes. The Rocks get less potatoes, and at 11 a.m. they get oats and peas in the straw; the Rocks get more oats than peas. They begin to scratch right away, being not half satisfied with the mash. I also cut in two a large sugar beet or mangel, and 20 hens will eat one-half nearly every day. Of course, lots of water, pure and clean, and oyster shells and charcoal are always on hand. In the evening they will get all the wheat they will eat up clean.

I am a very liberal feeder, still my hens always appear to be hungry, but at the same time they are in good condition and always fit for sale. When hens are moulting they should get the best of care. I coax them to eat, and I am convinced that at no time liberal feeding is more imperative than at moulting time. They get oilcake twice a week, and meat or bones every day in the mash. I have seen hens getting feathers in nearly four weeks, but at the very best they will not begin to lay again before eight or ten weeks. My hens laid well from January to October; still they laid on and off during November and December, paying for their feed, and I am getting now three dozen a day, and they are increasing. I do not keep cocks with hens unless in the breeding pens, and during the moulting season no cock at all. I do not keep more than twenty hens in a yard 60 x 60 feet, and in breeding pens four to twelve hens in yards 16 x 50 feet, and 20 x 70 respectively.

My hens never come in the houses during the day, and when they are gone to roost the windows are darkened. I do not want many windows in henhouses. One window in one compartment is

quite sufficient. Why do I want them dark? Well, first of all, windows admit too much cold during the night—far more than the heat amounts to that comes in during the day—then when the house is dark the hens will not see an egg laid during the night, and also they will stay on the roost till I let them out. Then the houses are cleaned, and the hens will remain out until night.

The nest boxes are in the scratching sheds, and are so arranged that the hens cannot roost upon them, and are also dark. Some hens have queer notions, and will refuse to lay where others are laying, so I nail a small box on the wall for them. I do not advocate the feeding of any condimental food. In fact, I am strongly opposed to them. The best egg producer known is green cut bones. A hen can get half an ounce every day and it will do her no harm. It is hard work to cut bones, but it pays. Still many people do not think that it pays to buy bones.

I am convinced that nothing on a ranch pays better than poultry. But, alas! They get the least care. Cow stables and horse stables are cleaned every day on most ranches, but it is not the case with the henhouse. I have seen many henhouses with bushels of manure under the roosts. Then people wonder why they don't lay, and how it is that they get the gapes or roop or lice and mites. Many a time I have seen them wading about in mud or icy water, the henhouse crowded and piles of manure in it. Well, sure enough, there are two classes of people who will never do anything with hens; those who are too lazy and those who are too greedy to invest time and money. Diseases of poultry and lice and mites are unknown things on my place. I never spent a cent for remedies or insecticides. Prevention is the best of all. It is of no use to put heart, soul, money, and time into the business unless judgment is exercised, and anyone engaging in this kind of business thinking to get a snap is very much mistaken.

I do not by any means claim to know all about poultry, but I do claim to know how to make hens lay, how to select males and females for breeding pens, for show, and for eggs, and how to take care of little chickens and raise them in the shortest time to maturity. When I began to keep hens, nine years ago, I knew all about it, like all beginners, but I was sensible enough to begin in a small way and got 11 hens of the nondescript kind, and a cock still worse. I could easily keep now 150 hens, still I keep only 100, until I have built more yards and houses.

I have noticed an inquiry about hens eating eggs. I once had Minorca hens eating eggs. The best way to prevent it is to take the bottom out of the nest box and have the bottom slanting, and another board underneath again, slanting the other way; the egg will roll down the incline out of sight. I also filled empty egg shells with red pepper and painted the outside of the shell with tincture of aloe. I also pared their bills. This is a cruel thing to do. Darkened boxes with a slanting bottom is the best I found.

THE FARM SEPARATOR.

Bulletin No. 50, issued by the Bureau of Animal Industry of the United States Department of Agriculture, is devoted to the farm separator and its relation to the creamery and the creamery patron. It was prepared by Ed. H. Webster, inspector and dairy expert of the dairy division of the Bureau of Animal Industry, and embodies in part the results of Mr. Webster's investigations and experiments during the year 1903. The section in which the work was done lies in Kansas and Nebraska. In those States the creamery business is a cream-gathering system. The hand separator has come, and the object of the investigation was to ascertain what the farmer and the buyer of cream can do to make the use of the hand separator most profitable to all concerned. Among the advantages of the hand separator it was found that by its use the cost of hauling butter fat to the creamery, or station, has been reduced to 1 cent per pound from the former cost of 2½ to 5 cents when the whole milk was hauled. The improvement in the quality of the skim milk separated fresh at home over that hauled to the creamery and separated, and then hauled home again, is another great advantage of the use of the hand separator. The investigation further showed that there are many authentic cases where farmers have sold from one-fourth to one-third more butter fat from the same herd after buying a separator. This has been due to the fact that when the whole milk was hauled to the creamery it was found necessary to hold back much more fresh whole milk for feeding to calves than is required when the milk is separated at home while fresh from the cows. Also, in busy times the milk was not hauled, and often the Sunday milk did not go to the creamery. The use of a hand separator also gives the farmer greater independence in the matter of selling, as cream can be shipped to greater or less distances, thus giving the farmer the choice of a number of creameries.

A number of pages are devoted to the care and management of the farm separator. Farmers are urged to see to it that the separator is run at the speed indicated by its manufacturer. This should not be guessed at, but the operator should time himself with a watch until he has become familiar with the speed. Running at too slow speed means a loss of butter fat by leaving it in the skim milk.

While some separators may work with cold milk, the farmer is advised not to skim his milk when it is cold unless he intended to leave butter fat in the skim milk. Do the separating as quickly as possible after the milk comes from the cow.

In cleaning the separator and dairy utensils do not use a dish rag and do not wipe with a towel. Wash first in warm water with

plenty of some washing compound, using a brush, but never a rag. Rinse with clean, warm water, and then either put them in boiling water or pour boiling water over them. Stand the parts up so that they will drain and they will dry quickly. It was found that about three-fourths of the farm separators were properly kept, but some of the remainder were in a very filthy and unsanitary condition.

Another section of the bulletin is devoted to the care of the cream on the farm. The first step is cleanly milking; second, separation while the animal heat is still in the milk; cooling the cream immediately after skimming, and keeping it as cool as possible thereafter until it is delivered. Different skimmings of milk should never be mixed. The place where the cream is kept should be used for nothing else, and should be kept sweet and clean. In hauling the cream to the station cover the cans with a wet sack or wet blanket to keep the cream cool.

A thorough investigation was made of the time which cream can be held in good condition before delivery. It was found that in only 10 per cent. of the cases was the cream sweet when it was delivered after it was more than twenty-four hours old. This test was made in midsummer, in a section where very few of the farmers had any facilities for keeping the cream cool.

BEE NOTES.

The following article is one of many sent in to *The Australasian Beekeeper* in response to a prize competition offered by that paper. The subject set was:—"The best procedure to obtain the greatest quantity of honey, from 20 hives, during the months from 1st September to 31st March."

"There being no guide given as to the financial part or otherwise of the owner of the 20 colonies of bees, I shall advise purchasing your supplies from one of the leading supply manufacturers, and might I say right here that after years of experience my advice is to buy standard goods. Don't go to your local saw-mill and expect him to cut you accurate work, and then later on have to return to a manufacturer of bee supplies for your later requirements, and then expect the two lots of goods to be exact fit and interchangeable, for it takes more accurate machinery to cut bee supplies than is to be found at the average saw-mill, and considering the low prices for good material accurately cut it does not pay to manufacture one's own, unless of course one is an expert with tools; and if you desire to sell at some future time, well made and well kept hives will always sell at an advance on the home-made. As 20

colonies would not require all my time to attend to I shall prepare for a larger amount of surplus room than would be needed where one had a larger number of colonies to attend, so that he could afford to give them his full time, with the prospect of only giving part of my attention to the 20 colonies. I should prepare by getting ready 50 full depth supers, 400 Root-Hoffman frames, 2lb. wire, 54lb. foundation, 5 2-story hives, complete, $\frac{1}{4}$ cwt. white lead, 5 gallons R. and B. linseed oil, 1 bee brush, 1 smoker, 1 bee veil, 2 honey knives, 1 honey-tank (to hold 40 tins), 1 2-frame Cowan extractor, and pair anchor rods, 1 uncapping trough, for which I strongly recommend the McIntyre as shown in the A.B.C. of Bee Culture, and anyone that can use a saw and a plane can construct one for himself for 10s. In the above only eight frames are allowed for each 10-frame super, as you get plumper combs of sealed honey, making it much easier to uncap; also 54lbs. foundation may appear large, but I am quite satisfied that money spent on full sheets of foundation is never regretted, for in the end it means more bees and more honey, as there is not a horde of useless drones being reared and maintained at the expense of the beekeeper; and if there is one thing more than any other, it is to allow plenty of surplus room to be added as required, and as we are after the greatest yield (provided always of course that there is honey to be gathered) a first outlay will not be injudicious. During any spare time or winter evenings, I should nail and paint the hives, nail and wire frames, fasten in foundation but not embed until required for use, as by manipulation and equalising right up to the honey flow I do not have to prepare for large amount of natural swarming, more especially, if all the colonies had been requeened early in the fall and of the leather stock, I should not count on any swarms. However it is bad policy not to be prepared for any emergency. My first September overhaul is to see that each colony has sufficient stores, those being short are fed. Any that have sealed combs of honey, these I bruise the cappings, causing the bees to remove the honey, thus stimulating to greater activity and brood rearing. See that each queen is doing her duty satisfactorily, and as I practice clipping each queen is now being clipped, being now more easily found. I change each colony into one of the hives already painted, clean off the floor boards (carrying along one space floor for the purpose), thus making one operation in changing. I leave all the brood in the second story, as this is much the warmer part of the hive for the present. Seeing to it that all combs are of the worker size, these removed bodies and supers are now painted ready for future use, the entrances being closed down (2 x $\frac{3}{8}$). In early winter the bees are now snug and warm, brood increases rapidly. At the end of another ten days I give all another run over, and reverse each alternate frame that may have brood only in one end, if the weather and condition of the colony warrants it I change places, a solid frame of brood with one partly filled to the centre, or, to make it more plain, if there is brood in say four frames the two outside combs will only be partly filled (and that on the inside) the two centre ones will be

solid to the end bars, thus if you change places and put the two outside combs in between these two solid frames of *sealed* brood, you give the queen a chance to enlarge her egg laying and not run the risk of chilling brood. Fruit or other early spring blossoms should now be coming into bloom, and brood rearing increases rapidly, and seven days is long enough to allow before the next visit, when in most hives I should expect to find the more advanced colonies with brood in at least eight frames. From those having eight or more frames of brood I remove two of hatching brood, and give to those that are backward the drawn worker combs that are removed from the weaker colonies are given to those from which the frames of brood were taken, thus the queens can use them immediately, and brood rearing forced in these advanced colonies, removing one or two frames of brood each seven days working until I have each hive in the whole yard of the exact same strength; I then put all the brood in the lower story, and the super of combs that was under is now placed on top and the entrances of all are opened to $\frac{7}{8}$in. by the full width of the hive. By using these large deep entrances swarming is reduced to a minimum, and on the very hottest days I find that bees do not hang out when hives alongside with small entrances were out badly and swarming. About October 1st there should be honey enough coming in, causing the queen to enlarge her brood circle, she will follow to the super and the bees prepare for swarming. I will add the 3rd story, destroying any queen cells that may be started, and make sure that the lower chamber is filled with brood, filling up from the super any that require it. I make a practice to see that no queen neglects the lower chamber, as many queens will not go below when once they start to follow the bees to the supers, and if you don't look sharp you may find a set of dry combs (or combs of pollen) in the lower chamber at the end of the season, whereas from outside appearances everything seemed normal. As each super is put on I place a piece of bagging (or better still, rubberoid, cut one inch smaller than the inside measure of the hive) on top of the frames, this will prevent the bottom bars of one set of frames being braced to the top bars of the under set of frames, and also acts as a break to keep the queen to the lower set of frames, and in no way hinders the bees from storing honey. This bagging material you will also find acts as a sure method to prevent the bees working combs upward from the top bars, which very often happens where wide spacing is practised. Should honey continue to come in slowly and your main flow not likely to be for a few weeks, your colonies will be getting overcrowded with bees and brood in several stories, and should any colonies persist in making preparations for swarming, I remove enough hatching brood, with adhering bees from 6 to 10 colonies to fill up a brood chamber and make a new colony, should there be enough brood from the 20 colonies to fill two bodies, I would make it one colony in a few hours, there will be enough young bees hatching to look after the whole; these being queenless, I will allow them to start queen cells of their own, and on the second day remove the young queen larvæ and graft with a just hatched larva from the best queen in the

yard, unless of course you may prefer to buy untested queens. Anyhow, these young bees will rear you just as fine queens as any for business. Push a 1in. nail into the comb alongside the cells that you graft in this way, so that, should the bees start any later cells you will know the ones you have grafted. Any surplus cells may come in for another divide should that be needed (November 1st). It is now reasonable to suppose that the honey flow has commenced in real earnest, and as I have given the bees plenty of room in advance of their requirements, they go to storing, and for a time give up the idea of swarming. In another seven days or even less, all should be ready for the 4th story; I only add each super as I note the bees well at work in the previous added story. In giving the 4th story, I sandwich it in between the 2nd and 3rd. If the flow continues good it may be necessary to extract all properly sealed combs, but if indications point to the near ending of the flow, or should there happen to be no likelihood of any intermediate flow, I leave all alone until all are sealed and well ripened, when each of the 20 colonies should average 120lbs., and if you manage to have the five extra hives filled by using up surplus brood as recommended above before the honey flow, it would be only fair to allow an average, say 60lbs., for the five new colonies. However, we will only base our calculations on 150lbs. average from the 20 original colonies, and if that can be kept up one year with another you are doing fairly well, certainly some seasons will double that, and many locations will average better reckoning on above 150lb. basis. We shall see how the result works out.

DEBIT.	£	s.	d.
50 full depth supers, 1s. 8d.	4	3	4
400 Root-Hoffman frames, 10s.	2	0	0
5 2-story hives, complete, 7s. 6d.	1	17	6
2lbs. wire, 9d., bee brush, 8d.	0	2	3
54lbs. foundation at 1s. 7d.	3	19	2
1 Cowan 2-frame extractor, £2 2s. 6d.	2	2	6
1 pair anchor rods, 1s.; smoker, 3s.	0	4	0
1 veil, 1s. 6d.; 2 honey knives, 3s.	0	7	6
1 honey tank (40 tins), 27s.	1	7	0
¼cwt. white lead, 7s.	0	7	0
Oil and driers, etc.	0	15	0
Uncapping trough, 10s.	0	10	0
50 honey tins (60lbs.), 11s. doz.	2	5	10
Freight and commission, say	2	0	0
	£22	1	1
CREDIT.			
3,000lbs. honey at 2½d.	31	5	0
60lbs. beeswax, 1s. 1d.	3	5	0
	£34	10	0
Less expenses	22	1	1
	£12	9	1

"In the foregoing I have not allowed for an extracting house; as a rule there is some building on the premises that may be used the

first season, but a permanent room is at all times to be recommended, and see to it that you build one large enough to allow for future progression, 12 x 12 would be none too large. A cheap serviceable building can be constructed of poles, with bagging or even calico tacked on to the outside frame-work, nail a ten inch board all round the bottom outside; to tack the calico to and prevent rotting, a good coating of cold water paint or stucco whitewash, then line with a cheap scrim. A good iron roof and floor, with any cheap case boards, will last a few good seasons extracting. If the frame were made substantial enough in the first place you can at some future date nail on weather boards."

Crabbe's Creek, N.S.W. GEO. JAMES.

OVER-STOCKING A LOCALITY WITH BEES.

At the recent conference of bee-keepers in this State, the question was raised as to the right of any person introducing colonies of bees in a district in which apiaries were already established. The same thing has been exercising the minds of our American cousins, and in the last issue of *Gleanings* an article appears bearing on this subject and the personal rights of bee-keepers; it is written by Mr. W. M. Whitney, and is as follows:—

"Such are questions that come up occasionally for the consideration of bee-keepers. In fact, in some localities the matter seems to assume a somewhat serious phase. A person keeping bees in a given locality, by virtue of the fact of being the pioneer in the business, and, perchance, in an ordinary season, has the region sufficiently stocked, it is contended, has the moral right, and should have the legal right, to warn off all persons attempting to carry on the same business as trespassers from such territory.

"Passing over the question of the legal rights of such a person, there can be no two opinions as to what they are. Let us consider the ethical side of the question. As the ultimate result (the money value) is the gist of this whole matter, it does not materially differ, so far as the rights between man and man are concerned, from any other rural pursuit, nor, in fact, from any other line of business.

"Suppose that some farmer starts out on some special line of agriculture, as, for instance, raising potatoes. I have in mind such a venture in New York, years ago. The first crop brought in the neighbourhood of 4s. per bushel, and several times over paid for

the land. Farmers all through that region caught the craze for raising potatoes. Those who lacked seed, the next spring bought at high prices. Potatoes sold in the fall at 9d. to 10d. per bushel. What right had these farmers to interfere with this man's special industry by glutting the market with potatoes? But who gave him a monopoly of this special food production to the exclusion of every other farmer? This monopoly business is just what we are all complaining about in almost every line of business. Over-production is within the recollection of many, of every commodity raised on the farm—grain, fruits, horses, cattle, sheep, hogs, wool, etc.

"Farms have been mortgaged to extend the business in hand, and lost by over-stocking—by over-production and competition. Turn on the searchlight for the turpitude in any of these cases, and find the guilty person if you can. So it has been the world over in every line of business. Successful ventures in any branch of manufacture tend to stimulate and extend the business until over-production follows, and, in many cases, bankruptcy is the logical sequence. Shall we run down and punish all except the pioneer in the various ventures which resulted in general disaster? Any rule of ethics that gives to an individual bee-keeper the exclusive right to a given territory, because he happens to be first on the ground, should give the same right to a person engaged in any other line of business for the same reason. Nothing would suit the monopolist better. The pioneer bee-keeper wants a monopoly of the territory, or, in other words, the business. What's the difference?

"To illustrate the fallacy of the position taken by those who claim a prior right, let us take a case in point as an object lesson. Two years ago Mr. M. Ethics started bee-keeping in a fine farming region having an abundance of white clover, considerable alfalfa, and many other honey-producing plants, and no bees within several miles of him. I know of just such a location now. He secured a little patch of ground for his home, on which he located 100 colonies of bees; he also secured an outyard which he stocked with another 100 colonies. Being the only person in the business, the outlook seemed all that one could desire. A large crop of fine clover and alfalfa honey was secured, and marketed at satisfactory prices as the result of the venture; also, the colonies had increased 50 per cent.; hence another outyard was established the following year. The farmers began to open their eyes, and look about themselves, and to inquire one of another whether they had not been stupid to let so much material wealth of the farm go to waste all these years. They began to read papers that told how to keep bees. Mr. Ethics noticed that they were stocking up all through his locality. The following is substantially Mr. Ethics' story as I get it from him through an interview, *a la* Doolittle.

"He said that, being the pioneer in the business, and as he had the locality fully stocked, it was ethically wrong for them to come into his territory and ruin his industry. He said that was

the way he looked at the situation at that time. But, they said to him that they were there first—in fact, were raised on their respective farms. Still, he argued that he was there first in the bee business; that the locality was fully stocked, and that any increase of bees meant absolute ruin to the entire business. He said, 'You ought to have seen how those farmers went for me. I didn't know but they'd have my hide nailed up on the barn to dry, the way they came at me.' They insisted that they owned the land on which the blossoms grew; that they paid taxes on their property to maintain the government; to support schools; to construct roads, etc., and could not understand why they had not the same right to furnish pasturage for their bees as for their cattle. One man said he had just rented a farm of 200 acres about a mile and a-half from Mr. Ethics' home yard, on which there was about 80 acres of very fine clover pasture; that he was moving his stock and other effects, among which were 50 or more colonies of bees. Of course he admitted that he was not first on the ground, but could not understand by what law of ethics he had not as good a right to pasture his bees on land he paid rent for as another had who paid nothing.

"Mr. Ethics told me this and much more. You know he's a glib and smooth talker. He said it was night when he got home; that he went to his room and shut himself in, and sat down to think, with nothing but the stillness of the night and his inward self to commune with; and, by the way, that's a pretty good practice when one wishes to do any hard thinking, and more especially when self is interested in the outcome. He said, 'After thinking the matter over I came to the conclusion that, as compared with these men, my claim vanished into thin air; and if any one moved it was my business to do it; yet none of them objected to my remaining and making the most of my enterprise. I said to myself, 'Every time you opened your mouth you put your foot in it; in fact, you've made a fool of yourself, and you'd better go away back and sit down. These men have the same moral right to keep bees for the production of honey that they have to keep cows for the production of butter and cheese.'

"Then I said to him, 'That's the right kind of talk; that's the kind of ethics I like. The bee-papers all tell the farmers to keep bees, and I think every one of them should do so—not in a slipshod way as many do, but in an up-to-date manner as everything else should be done on the farm. Fruit-growing is a part of farm industry, and bees are inseparably connected with fruit-raising. I think every farmer's family in the land should have lying on their centre-table some good bee-journal, as well as one on fruit-growing and on general agriculture.'

"Every farm with one to 10 colonies of bees properly kept, with a good bee paper as a guide, would introduce one of the most interesting pursuits of rural life, and furnish the family one of nature's most delicious delicacies. Ethical rights of an individual to territory he does not own."

COTTON INDUSTRY.

Interest has been recently shown in the possible cultivation of cotton in this State. While it has been proved that cotton can be grown here, yet it is a question of labour as to the making of it a profitable industry or not. The following able article, from the pen of Mr. A. N. Pearson, Dir. A.E. & C., which appeared in the last number of the Natal *Agricultural Journal,* is worthy of reprinting:—

INTRODUCTORY.

There is now in existence an active movement for fostering the growth of cotton in various parts of the British Empire. The influence of this movement has recently reached Natal, and many people are now asking for information about cotton growing, and where they can obtain the seed.

The establishment of new agricultural industries is urgently needed in Natal for the proper progress of the country's development, and if cotton can be profitably grown here there is no doubt it would be a good thing for the country to have it grown, and no failures or unfavourable experiences in the past should prevent a fair and dispassionate inquiry into the subject at present.

Cotton growing is no new thing in Natal. It was started here in the early sixties, when the American cotton supply failed owing to the civil war, and prices were high in consequence. At that time a British Cotton Supply Association was formed, which made special efforts to encourage the growth of cotton in various parts of the world. The attention of this association was given, amongst other countries, to the Cape and Natal, and as a consequence cotton growing was started here. The late Cecil Rhodes was one of the pioneers of the industry in this colony. Mr. J. Kirkman, of Esperanza, has recently stated that in 1871 he grew a crop of 300lbs. clean cotton per acre, for which he received 8d. per lb. in Liverpool, 4¼d., however, being absorbed out of this for merchants' charges. Mr. W. H. James, of Zwolle, has stated that he planted 50 acres, which yielded at the rate of 300lbs. per acre, and for which he received 6¼d. per lb. in Durban. These prices were good as compared with prices generally.

After the cessation of the American war, the world's cotton supply increased, and prices fell. Owing to this and other causes —amongst which was the rush to the Kimberley diamond fields— cotton growing in Natal came to an end.

PRESENT POSITION OF COTTON MARKET.

Of recent years, another rise in price has occurred, and there has been a shortage of supply to the Lancashire mills. Last autumn most of the mills using American cotton were working only 40 hours per week instead of 55½, and it was estimated that during the last three months of 1903 £2,000,000 less were paid in wages

to the cotton workers than in normal times. There has been, indeed, a cotton crisis, and the cotton manufacturers of England have again formed an association, called the British Cotton Growers' Association, the aims of which are to foster the growth of cotton in suitable parts of the British Empire.

The present rise in price is not due to any failure or diminution in the American crops, or, indeed, in the world's crops, but apparently to the operations of American speculators. In a paper recently read before the Society of Arts (*Jour. Soc. Arts*, 8th April, 1904), Mr. Alfred Emmott, M.P., said: "There are two elements discernible in the increased prices of the last few years. The first may be called a legitimate rise of price, due to the increased demand. The second is due to a singularly daring move on the part of a group of American speculators. It is quite impossible satisfactorily to separate the effect of these two causes."

In so far as the rise in price is due to speculation, it cannot be expected to continue, and therefore no conclusions as to the probable profitableness of cotton growing in Natal can be based on present prices. The following figures, taken from Mr. Emmott's paper already referred to, and showing the progress of prices on the Liverpool market for the last 35 years, are instructive:—

AVERAGE PRICES PER LB. OF "MIDDLING" AMERICAN COTTON ON THE LIVERPOOL MARKET.

	d.		d.
1870-4	9·21	1898	3·31
1875-9	6·56	1899	3·55
1880-4	6·35	1900	5·47
1885-9	5·52	1901	4·75
1890-4	4·66	1902	4·75
1865-7	4·13	1903	6·03
1904	9·00d. (?)		

(NOTE.—American cotton is divided into four classes—good ordinary, low middling, middling, and good middling. The above are the prices of "middling," the highest price but one.)

There was, it will be seen, a gradual fall of prices from the time of the cessation of the American war down to 1898, in which year American middlings sold in Liverpool at the very low price of $3\frac{1}{3}$d. per lb. It is not surprising that the Americans should have made an effort to raise prices. Through the natural course of industrial development, and also, no doubt, stimulated by the fall in prices, the Americans have considerably increased the local use of cotton grown in the States. This increase has taken place more particularly in the Southern States, that is to say, in the cotton-growing area, as shown by the following figures:—

ANNUAL CONSUMPTION OF UNITED STATES COTTON IN MILLS.

	IN THE NORTHERN STATES.		IN THE SOUTHERN STATES.
1888-90	920 million lbs.	...	245 million lbs.
1901-03	1,128 " "	...	962 " "
Increase in 13 years	208 " "	...	717 " "

This growth of the cotton manufacturing industry in the States is still in progress, and there is every prospect of the Americans consuming more and more of their cotton locally. Besides this increased local consumption, there has concurrently been an increased export of American cotton to European Continental countries, as shown by the following figures taken from Mr. Emmott's paper already quoted:—

DISTRIBUTION OF UNITED STATES' COTTON CROP.

	Exported to Great Britain.	Exported to European and other Ports.	Consumed in the States.	Total Crop.
1876-80	1,075	622	775	2,473 million lbs.
1886-90	1,418	892	1,129	3,439 ,,
1896-1900	1,472	1,655	1,705	4,832 ,,
1901-3	1,489	1,800	2,092	5,381 ,,

The exports to Great Britain increased by only 40 per cent. during the 25 years, whereas the exports to European Continental and other ports increased by nearly 200 per cent., and the local consumption in the States by 116 per cent. For 15 years the exports of American cotton to England showed no permanent expansion.

This condition of the American exports to England is a serious one, because England is dependent almost wholly upon the United States for its raw material; more dependent, indeed, than other countries, and more dependent now than in the time of the American war. The English mills are specially dependent on the United States, for the reason that English cotton machinery has of recent years been developed to work up only the fine long-staple cotton which is produced in highest excellence by American growers and only in very small quantity in other parts of the world. Thirty-five years ago English mills could take any class of cotton from any part of the world. The German and other Continental mills can still do so.

The following figures, taken from the recent report to the Board of Trade, on British Cotton Cultivation, by Professor Dunstan, Director of the Imperial Institute, show the paramount position of the United States, not only in relation to the English cotton trade, but also in relation to the whole world's cotton supply:—

PRODUCTION OF COTTON IN VARIOUS COUNTRIES.

(In million lbs.)

	1898	1899	1900	1901	1902	*1903
United States ...	5,677	5,795	4,757	5,298	5,430	5,500
India, Ceylon, and Straits Settlements	853	967	304	851	931	1,500
Egypt	645	553	637	538	644	500
Other Countries	...	...	...	...	...	500
	7,175	7,315	5,698	6,687	7,005	8,000

(* Figures for 1903 from Mr. Emmott's paper.)

IMPORTS TO GREAT BRITAIN.

(In million lbs.)

	1898	1899	1900	1901	1902	1903
United States	1,805	1,234	1,365	1,481	1,364	1,361
India, Ceylon, and Straits Settlements	27	31	37	37½	33	82
Egypt	276	343	312½	282	355	296
Other Countries ...	20	18½	46	29	65	54
	2,128	1,626½	1,760½	1,829½	1,817	1,793

It is instructive to notice the sudden drop in the imports of American cotton to Great Britain in the year 1899. Reference to table of prices given earlier in this article will show that this sudden drop followed the extremely low prices of the year 1898. These prices were evidently not remunerative; indeed it is said that the American planters cannot grow cotton profitably at less than 4d. per lb., and in 1900 they restricted the area planted, whereupon the cotton yield fell by more than 1,000,000,000lbs.

Notwithstanding this temporary reduction in the American cotton crop, the world's cotton supply has been steadily increasing during the last 25 years. The following figures show this:—

ANNUAL AVERAGES OF THE WORLD'S COTTON CROP

1879-83	4,340 million lbs.	1889-93	5,770 million lbs.
1884-88	4,800 „	1894-98	6,680 „
1899-1903	7,840 million lbs.		

That the demand for cotton is increasing concurrently with the increased supply is shown by the following table—given by Mr. Emmott—of the number of cotton spindles at work in various countries:—

NUMBER OF SPINDLES AT WORK IN VARIOUS COUNTRIES.

	1895.	1899.	1903.
Great Britain	45,400,000	45,500,000	48,000,000
European Continental	28,200,000	32,500,000	34,000,000
United States	16,100,000	18,300,000	22,000,000
India	3,800,000	4,700,000	5,000,000
Japan, Canada, Mexico, etc. ...	...	...	3,000,000
Total	93,500,000	101,000,000	112,000,000

THE PRESENT OUTLOOK FOR NATAL.

The above brief survey of statistics connected with the cotton trade will give a fair insight into the nature and causes of the existing demand for cotton, and will assist prospective Natal cotton-growers to form some judgment concerning the permanency of present prices.

To summarise:—It appears that present high prices are due to an American combination which may at any time split up, allowing prices to fall again. It is evident, however, that there

is a limit below which prices cannot permanently remain; namely, the limit of profitable production. The American planter can grow cotton profitably at 4d. per lb. When prices fall below that he restricts his area; when they rise above this he increases his area. But for the kind of cotton suitable to the Lancashire spindles—the fine long-stable cotton grown along the coast tracks of the Southern States—the area in the United States fitted for its growth, so far as is at present known, is limited, consequently the crop from the area is always liable to be operated on by American speculators. British manufacturers have realised this: in 1901 they began to make preparations for a crisis, and in 1902 formed the Brittish Cotton Growers' Association for fostering the growth of cotton in the Empire. If they succeed in considerably increasing the world's cotton growing area, prices will fall. This is their weapon for dealing with the American speculator. As Mr. Emmott in his paper says, "so far as our troubles arise from unbridled speculation, the best remedy that can be applied is to smother the speculators in cotton." This smothering process may, however, go so far as to defeat its own ends, for a sudden fall in prices would crush out the cotton-growing industry newly started in various parts of the Empire. In Natal there would be only two ways in which the industry could survive such a fall of prices. The one would be by growing only the very finest kinds of cotton, which would always command remunerative prices; the other would be by starting cotton mills here, so that the colony could, if necessary, protect itself by fiscal measures.

As regards growing the finest kinds of cotton, it is to be recognised that the prices of cotton vary within very wide limits according to the quality of the fibre. A long, fine, strong, silky, clean, white fibre may bring a price of 1s. 9d., 2s., and even 2s. 6d. per lb.; while a short, thick, weak, rough, dirty and discoloured fibre may bring only 3¼d. in the same market. Very fine samples of cotton may sell at even as high a price at 4s. 7d. per lb. (*West Indian Bulletin*, Vol. IV., p. 224.)

RECENT WEST INDIAN EXPERIENCES.

The efforts recently made in the West Indies to establish the cotton-growing industry are very instructive to Natal. The cotton selected for growth there is mostly the long-fibred kind known as Sea Island. The following are some of the prices realised in Liverpool during the past season:—For 12,000lbs. from St. Kitts, 13½d. per lb.; for 5,500lbs. from Barbadoes, 12½d. per lb.; and for 3,500lbs. from the same island, 13½d. per lb.

"On 26th of August, 1903, 6¼ tons of Sea Island cotton from the West Indies were sold in Liverpool at 26c. (13d.) per lb. 'Other Sea Island cotton from the West Indies brought from 21 to 24c. (10½-12d.) per lb., and West Indian Uplands brought 14½c. (7½d.)." (*Demerara Argosy* 9th Jan., 1904.) A sample from the Hothersale Estate, Barbadoes, was valued by a firm of Liverpool brokers at 14d. per lb., and the brokers reported as follows:—" With regard

to your inquiry as to what the cotton would fetch when the market is in a normal state, the values would be ruled entirely by the supply and demand of Sea Island cotton, quite irrespective of the prices for the ordinary American description, that is, middling American might drop 1½d. to 2d. below present quotations without influencing values of Sea Island cotton in any way, which has a special and limited market of its own. The range of values in Sea Island descriptions is very great, from 13d. for the medium fine to 21d. for extra fine." And again: "The opinion here (Liverpool) seems to indicate that spinners will take up all (like this sample) they are likely to have offered; the experience being that so little of this quality can be grown satisfactorily over a series of years."

"'We give you the figures for Sea Island descriptions for the last four years, that is, total sales and prices (fine and extra fine), as follows:—

1900.	1901.	1902.	1903. (To end of Aug.)
350 bales, 13½d. to 21d. per lb.	890 bales, 13½d. to 20d. per lb.	130 bales, 13d. to 20d. per lb.	280 bales 13d. to 21d. per lb.

(A bale is 500lbs.)

You will see that the quantity sold has not been large, and, over the period named, prices have remained remarkably steady.

"This cotton is principally used for making a specially fine thread used in needlework and lace working. It is an expensive article, and it doubtful to what extent the demand would expand, without some shrinkage in value, if the supply were to be increased to any very large quantity." (*West Indian Bulletin*, Vol. IV., p. 320.)

There is difficulty in growing cotton of this quality satisfactorily; it will grow only in suitable climates near the coast, and the cultivation of it requires care and intelligent supervision. But in any efforts to establish cotton growing in Natal, special attention should be paid to the high-priced varieties.

VARIETIES OF COTTON.

Several varieties of cotton are in cultivation. Botanically they all bear the name of *Gossypium*, and are derived from a number of wild species growing in various parts of the world. Botanists have differed as to the number of original species of *Gossypium*. Linnæus recognised 5 species; Parlatore, 7; Todaro, 52, and the Kew index records 40. The late Baron von Müeller, in his "*Plants eligible for Industrial Culture*," named 7 species as follows:—

Gossypium arboreum.—The tree cotton, found in Egypt, Abyssinia, Senaar, and Upper Guinea. New Orleans cotton, named *Gossypium sanguineum* by Haskari, was included by Müeller in the species *arboreum*.

Gossypium barbadense.—Sea Island cotton, occurring from Mexico to Peru and Brazil. By some it is said to have been in-

digenous to the Island of Barbados. Müeller included certain African indigenous cottons in this species, namely, *Gossypium kirkii*, from Dar Salam, *Gossypium anomalum*, from tropical Africa, and the "Bamia" cotton of Egypt.

Gossypium herbaceum.—Indigenous to Persia, Afghanistan, India, and some other parts of tropical Asia. *Gossypium indicum*, *neglectum*, and *roseum* are regarded as belonging to this species. Some writers include in it also the American Upland Cotton.

Gossypium hirsutum.—The American Upland or Short-staple cotton; indigenous to tropical America.

Gossypium religiosum, or *peruvianum*.—Kidney Cotton, Peruvian or Brazilian Cotton. Concerning this species, Müeller wrote: "The Cotton is of a very long staple, white, somewhat silky, and easily separated from the seeds. This is the tallest of all cotton bushes, and is probably the species which occurs in the valleys of the Andes as a small tree, bearing its cotton while frosts whiten the ground around." It is said to yield large crops for 4 to 5 years, lasting 8 to 10 years without renewal.

Gossypium taitense.—Occurs in several of the Pacific Islands.

Gossypium tomentosum.—Indigenous to Hawaii.

Although the botanical species may be few, the cultivated varieties are very great. In India, according to Mr. Mollison, the Inspector General of Agriculture, at least 100 varieties are in cultivation. The number in other countries must be very great. Varieties are easily made and easily altered; and they cannot be relied upon to remain constant in either the quality or quantity of their produce. They readily change in character according to soil and climate. If left to themselves they rapidly deteriorate. The best cotton grown is the Sea Island, cultivated mainly on a series of islands fringing the shores of Georgia and South Carolina. In these regions it produces fine, long, silky lint, sometimes over two inches in length; but when grown inland in the same States the fibre thickens and shortens, approaching in character the usual "Uplands" cotton of those States. In India many experiments have shown that "the agricultural characters of any variety may be very much modified by moving it from one district to another," and that "the fibre, more than anything else, is injuriously affected by change." It is evident, therefore, that although seed of the best varieties may be selected for importation into Natal, the produce here may be inferior to that produced by the same seed in the country of its origin.

QUALITIES TO BE ATTENDED TO IN SELECTING VARIETIES.

The qualities to be attended to in selecting varieties for cultivation are length, strength, fineness, texture, and colour of fibre, proportion of fibre to seed, ease of separation of fibre from seed, prolificness, earliness of ripening, hardiness, and resistance to diseases and pests. The first consideration of those who grow for the English markets must be the quality of fibre.

The following list shows the qualities of fibres in the chief commercial varieties:—

	Name.	Where grown principally.	Length of Fibre in inches.	Diameter of Fibre. — Millionths of an inch.	Texture and Colour of Fibre.	Value in Liverpool in 1903.
NORTH AMERICAN.	Sea Island ... (G. barbadense)	Coast of South Carolina and Georgia	1·7—2·2	600	Soft, silky, regular, white	10½d. to 2s. 1d.
	Upland ... (G. hirsutum)	Interior of South Carolina and Georgia	1·0—1·2	775	Soft, clean, bright	4¾d.—7½d.
	Mobile... ... (G. hirsutum)	Alabama ...	·95—1·05	775		
	Texas ... ... (?)	Texas	·7—1·0	775	Firmer than Upland, but not so bright	
	Orleans ... (G. arboreum)	Louisiana and Mississippi	1·0—1·2	775	Best and most regular of American short staple cottons. White or creamy.	
SOUTH AMERICAN.	Brazil ... ... (G. religiosum)					8½d.—9¼d. (in 1904)
	Pernams	Brazil ...	·9—1·5	790	Harsh; gives wiry feel to yarns	
	Ceara, etc.		1·0—1·3			
	Paraiba		1·1—1·3			
	Santos		...			
	Bahia ...		...			
	Avacaiju		...			
	Maceio		1·1—1·3			
	Maranhams		·9—1·3			
	Peruvian ... (G. religiosum)					
	Peruvian— Soft Staple / Hard Staple	Peru	1·0—1·2	800	The soft staple is similar to Orleans	
	Sea Island	Introduced into Peru	...	...	... ...	
EGYPTIAN.	(G. barbadense) (G. kirkii) (G. anomalum)					The average price realised by Egyptian cottons in Liverpool in 1903 was 7·82d. Prices in 1904: 8¼d. to 10¾d.
	Mitafifi / Abbasi	Lower Egypt ...	1·0—1·6	...	Long, very strong, soft yellowish brown, easily picked & ginned	
	Ashmouni ...	Upper Egypt ...	...	...	... ...	
	Yannovich ...	Egypt	1·4—1·6	600	Strong, silky, better than Mitafifi; but not so prolific	
	Afifi	,, ...	...	...	... ...	
	Zafiri	,, ...	...	...	... ...	
	Gallini ...	,, ...	1·2—1·5	...	Brown, soft and silky; and white, hard and harsh	
	Hamouli ...	,, ...	...	...	... ...	
	Bamia ...	Lower Egypt ...	...	...	Not as strong as Mitafifi, and darker in colour	

QUALITIES OF FIBRES—*continued.*

	Name.	Where grown principally.	Length of Fibre in inches.	Diameter of Fibre. Millionths of an inch.	Texture and Colour of Fibre.	Value in Liverpool in 1903.
INDIA.	(G. herbaceum and arboreum)					
	Early Cottons.					
	Bengals, Oomras	Punjab, Central India, Bengal	...	...	Short, weak, silky, scanty, white	
	Belati, etc. ...	Hyderabad ...	...	...	Short, woolly, coarse, white	
	Hinganghat ...	Central Provinces	...	...	Fairly long, silky, white	
	Late Cottons.					
	Dholleras ...	Kathiawar ...	...	...	Fine, silky, almost equal to Broach	
	Broach ...	Surat. Baroda, and Broach	·75—1·0	844	Fine, silky, white; loosely adherent to seed	3d.—4½d. (?)
	Dharwas ...	Dharwar ...	..	...	... ...	
	Koomptas ...	South Deccan ...	...	...	... ...	
	Westerns ...	Madras & Deccan	...	...	... ...	
	Cocanadas ...	Kistna Dis., Madras	...	...	... ...	
	Tinneveleys ...	South Madras ...	...	...	Most valuable of Madras cottons	
	Salems or Coimbatores	Coimbatore ...	...	...	Short, white; firmly adherent to seed	

VARIETIES TO BE SELECTED FOR NATAL.

A glance at the above list will show that the most valuable of all the cottons is the North American Sea Island. It is used not only in the finest fabrics, but also in materials which need strength with lightness, such as sail-cloths, post bags, and the linings of bicycle tires. It is, however, one of the most delicate of the cotton plants; needs a moist, warm atmosphere, and careful cultivation, and cannot be grown successfully more than 50 miles inland. It suffers perhaps more than any other from change of environment. It was grown for 30 or 40 years in Egypt, but was finally abandoned as unsatisfactory. It has been grown in Natal, and Professor Dunstan states that a sample of Natal-grown Sea Island cotton was recently examined at the Imperial Institute, and was found to be fairly well cleaned, white, with faint reddish tinge; its staple varying from 1½ to 2 inches. It was valued by brokers in February of this year at 7½d. per lb.

Sea Island cotton is not so prolific as the American Uplands, but its superior value makes its cultivation more profitable in districts where it can be successfully grown. The average yield in South Carolina is about 200lbs. of lint per acre, although yields of over 400lbs. are obtained on the best soils or with the best cultivation.

Recently, some improved varieties of Sea Island Cotton have been produced by systematic selection. One of these—the Seabrook—has been improved in the direction of prolificness; another, originated by Mr. Clarke, of Columbia, South Carolina, has been improved in the direction of fineness and length of staple, the average length being about $2\frac{1}{2}$in.: this cotton fetches 2s. 1d. to 2s. 6d. per lb., when ordinary Sea Island sells at $7\frac{1}{2}$d. to 15d. Another—the Rivers—has been improved in the direction of resistence to the disease known as "wilt" or "black-root," and will produce a perfect crop in the midst of plants of the ordinary kind which are practically destroyed by the disease. Others are being improved in the direction of resistance to insect attacks.

Next in value to the Sea Island are the Egyptian cottons, and of these the Yannovich is the most valuable in regard to the quality of its fibre, although it is not so prolific as the Afifi and Abbasi. The Mitafifi is described by Dunstan as "very hardy, and not so sensitive to climatic changes as are some other varieties." Egyptian cotton is "more lustrous and mercerises better than American Upland cotton." (Mercerising is a process of chemical treatment of cotton fabrics by which they are given the appearance and lustre of silk; this process is coming largely into use.) The Egyptian cottons are hardier and less liable to disease than Sea Island. It is instructive, however, to note that while Sea Island cotton has not given satisfaction in Egypt, Egyptian cotton, on the other hand, has not gained favour when grown in America. This is a notable illustration of the sensitiveness of cotton plants to change of environment.

The South American varieties are hardy; otherwise, with the exception of the soft staple varieties, they have not much to recommend them.

The North American Upland and New Orleans are short stapled, but easily grown, and very prolific. The average yield in the States is variously given at from 190 to 400lbs. But with good cultivation yields of 800lbs. clean lint per acre have been obtained. The kind formerly grown in Natal appears to have been mostly New Orleans; and much of this variety is now growing wild in the country.

The least valuable of all the principal cottons are those of India. Their low value is illustrated by a story of the Lancashire Cotton Famine related by Mr. Emmott in his paper before the Society of Arts. At a prayer meeting in that time of distress someone was praying: "O Lord, give us more cotton," when another worshipper ejaculated "Yea, Lord, but not Surats." The Government of India is now initiating systematic efforts to improve the quality of the indigenous varieties. American varieties have been extensively tried in India, but without success; and it has been decided that the only feasible method of improvement is the systematic selection of local varieties aided by cross-fertilisation. But although the quality of the fibre is low, the Indian cottons are,

on the whole, probably the most hardy of all, and it might be useful to introduce a few of the best Indian varieties into Natal for the purpose of cross-fertilisation.

Taking all the facts into consideration, the following list may be suggested as indicating the seeds which it would be advisable for the present to import into Natal for the purpose of re-introducing the cotton growing industry:—

For immediate growth ...	Sea Island	Some of the best improved strains.
For experimental cultivation	Egyptian	Yannovich, Mitafifi, Afifi, Abbasi, Ashmouni.
For immediate growth	Orleans / Uplands	Selected strains from the Georgia, South Carolina and Louisiana Experiment Stations.
For cross fertilisation ...	Indian ...	Bani of the Central Provinces. Deshi of Broach. Gundi Goghari of Kathiawar. Koompta of South Deccan.

VARIETIES MUST BE IMPROVED BY SELECTION IN NATAL.

It is not to be expected that the best results will be obtained from any of these varieties immediately after their introduction. It has been shown above that cotton plants suffer from change of environment. Nor is it to be expected that the imported varieties will improve of themselves in the course of a few years by natural adaptation to new conditions. On the contrary, experience in all countries has shown that the cotton plant, if left to itself, quickly deteriorates. It will be necessary, therefore, at the very outset to commence work on improving the imported varieties. It may be well at the same time to undertake experiments in improving the cotton which has escaped from previous cultivation in Natal, and is now growing wild here, and which may be considered to have become thoroughly acclimatised.

The necessity for constant improvement of cotton by systematic selection has been shown by lengthened experience in other countries, and is emphasised by many writers on the subject.

Professor Dunstan, in his report to the Board of Trade, wrote as follows of the Indian cottons:—

"It is probable that nearly every indigenous variety of cotton has degenerated. This degeneration is due not only to exhaustion of the soil and inferior cultivation, but is largely owing to the continued use of seed of the same strain for many generations, and to want of care in its selection. The experiments have demonstrated that the length, quality, and yield of cotton fibre are favourably affected by superior conditions of cultivation, and by selection of seed from the most prolific plants continued from year to year.

"Persistent efforts have been made for many years to introduce exotic varieties of cotton into general cultivation in various parts of India. . . The effects of acclimatisation and of unfavourable conditions of soil and climate have altered the characteristics of exotic cotton in many ways, particularly in

deteriorating the size of the bolls, the size of the seed, the proportion of lint to seed, and the percentage of oil in the seed. Recent experiments with American and Egyptian seed have shown that although exotic cottons generally deteriorate in India, the deterioration can probably be arrested, and possibly improvement effected in acclimatised varieties by controlled cross-fertilisation."

In a recent report of the Government of India, on the improvement of Indian cotton, it is stated:—

"The establishment of seed farms has also been recommended by the Board of Scientific Advice, and is under the consideration of the Inspector General of Agriculture. The attempts made in the past to place improved descriptions of seed within the reach of the ryot have not been uniformly well judged or successful. It is intended, however, as the report of the Inspector General shows, to take action in the direction suggested as soon as the experiments now in progress have proved the adaptability of improved types of cotton to the ordinary conditions of soil and climate in particular districts. We hope shortly to be in a position to distribute seed from Government farms.

Systematic improvement is being vigorously carried on in America. Mr. Gustave Speth, of the Experiment Station in Georgia, writing to Professor Middleton, of Baroda (*Indian Agricultural Ledger*, 1895, No. 8), stated:—"Until recently American selectors of cotton-seed were content to work with the products of chance cross-fertilisation. In such cases all improvements are accidental. With our present knowledge we go further; we propose carrying on our operations in specific directions—in our work we have always a specific object in view: for instance, to change the formation of plants or to improve the length of the staple of prolific varieties having short staples. Cross-fertilisation is only the first step in the improvement of the cotton-plant. Breeding and selection are of almost greater importance, as often four to six plants of entirely different growth and formation are the result of the second year's seed (care, of course, being taken to prevent crossing by accident)." And Professor Newman, of South Carolina, wrote:—"In making new varieties, more dependence is placed on the careful selection of seed from typical plants than on hybridisation."

AMERICAN METHOD OF IMPROVING VARIETIES.

In the *Year Book* for 1898 of the United States Department of Agriculture, Mr. Herbert J. Webber, Physiologist in charge of the plant-breeding laboratory of the department, gave a detailed description of the method of improvement by selection adopted by Mr. W. A. Clark, a progressive cotton planter, of Columbia, South Carolina. Mr. Webber pointed out that it was not possible to greatly enlarge the area devoted to cotton-growing in the United States, and that if production was to be increased it would have to be by the growth of heavier crops. An important step towards this

was the improvement of varieties by methods similar to those adopted by Mr. Clark.

The following is a condensed account of Mr. Clark's method:—

First Year's Selection.

The first selection is made in the general field. Each plant is somewhat hastily examined, special attention being given to vigour and productiveness, to strength, silkiness, and general quality of the staple, etc., and a number of the plants are marked.

The selected plants are then carefully compared, and systematic notes taken. The following is a copy of Mr. Clark's notes of 1895:—

No.	Stalk.	Pod.	Bearing.	Lint.
1	Medium ...	Medium ...	Close, fairly double ...	Fair
2	" ...	" ...	Good	"
3	Large ...	Large ...	Close and double ...	Fine and long
4	" ...	Medium ...	Extra close and double ...	" "
5	Medium ...	" ...	Close and double ...	" "

Critical house examinations of the specially-selected plants are then made; the fibre being pulled, and graded under the following headings:—Covering of seed, size of seed, length and fineness of staple, and uniformity in length.

The following is a specimen of the notes of grading:—

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Covering of Seed	First	Fifth	Second	Fourth	Third
Size of Seed	Second	Fifth	Fourth	Third	First
Length of Fibre	Third	Fifth	Fourth	First	Second
Fineness of Fibre	Fourth	Fifth	Third	First	Second
Uniformity of length of Fibre	Fifth	First	First	First	First

NOTE.—All stalks present good appearance in field except No. 3, which is defective in middle top.

To the first place is given five points, and to the fifth place one. The points assigned to the various plants would thus come out:—No. 1, 19; No. 2, 5; No. 3, 16; No. 4, 20; No. 5, 21.

Nos. 4 and 5 would therefore be the best. The ginning quality is then tested, and the proportion of lint to seed determined. It may here be explained that the seed with the wool attached is called "seed cotton"; the wool when detached from the seed is called "lint." In the early days of American cotton-growing the proportion by weight of lint to seed cotton was 1 : 5. By gradual improvement it has been brought up to 1 : 3. The aim is to bring it up to 1 : 2.

The fibres from the different plants are then sent to a cotton "factor," who grades them according to their market value. The factor, in the particular case described, selected the fibre of No. 5 as the best. This plant, therefore, having obtained generally the highest number of points, was selected for breeding.

Second Year's Selection.

The seed of the plant selected the first year is sown at regular distances in the spring of the second year, producing 500 or more plants. These in their turn are examined, and selections made in the same way as in the first year, and the best plant picked for the third year's selection. The seed from the remaining plants is sown in the third year on a five-acre patch, to produce seed for the fourth year's general crop.

This process is continually going on, as illustrated by the following diagram:—

1st year......	1 selected plant				
2nd year......	500 plants	1 s. plant			
3rd year......	5 acres	500 plants	1 s. plant		
4th year......	General crop	5 acres	500 plants	1 s. plant	
5th year......	... ...	Gen. crop	5 acres	500 plants	1 s. plant

The above brief description of a process of selection illustrates what is proceeding systematically on several of the American plantations, as well as on the Experiment Stations. The result is remarkable in many cases. The fibre in one instance has, in the course of a few years, been raised from $1\frac{3}{4}$ or 2 inches to $2\frac{1}{2}$ inches; being at the same time improved in strength and lustre. The finest grades of this strain are used to adulterate silk, and they fetch more than double the price of the ordinary.

Mr. Webber states:—"These high-bred strains are maintained only by continuous selection, and if for any reason the selection is interrupted there is a general and rapid decline in the quality of the staple."

Reference has already been made to the River's Sea Island strain, which has been selected so as to resist the disease known as "wilt" or "black-root," and to selections now being made in the direction of producing insect-resisting strains.

If the cotton-growing industry is to be successfully established in Natal, this work of improvement by selection will have to be commenced from the very outset; and it is not unreasonable to suppose that by its means success may be attainable. Mr. John Kirkman, writing on the 14th June, expresses this opinion in the following words:—

"Your report contains the secret of success, viz.: 'Seed from Experimental Government Farms.' We can start with fresh seed

from America and Egypt, but, after two years, it will deteriorate. Then to you must we look for direction to keep up a healthy plant."

In the next issue will appear a continuation of this article dealing with the practical details of cotton-growing, and the question of its profitable cultivation in Natal.

EXPORT OF ORANGES.

On the first of the present month three cases of Washington navel oranges were sent by mail steamer to Adelaide for exhibition at the Royal Agricultural Show there.

On the receipt of the oranges at the Department in Perth by the horticultural expert, it was found that one lot received from the South-West were certainly the finest, but owing to the careless manner in which they had been packed they suffered considerably, and fears were entertained that they would not carry.

It is pleasing to hear, however, that the cases arrived in Adelaide in good condition, and the fruit was very much admired.

In reporting on the packing, Mr. Despeissis states that:—"When re-packing oranges for shipment to South Australia I kept back a few specimens for purpose of examination, and I find that those that had been received packed in grease-proof paper had kept splendidly, while those that had been packed in chaff showed signs of mould, etc. This had been caused by the sharp ends of the pieces of chaff breaking the skins of the oranges and so damaging them."

COMPARATIVE STATEMENT showing the Areas actually laid down with WHEAT and OATS for GRAIN and HAY during last season (1903-1904), and those estimated to have been laid down during the present season (1904-1905).

Magisterial and Police Districts.	Estimated Area laid down, Season 1904-1905.						Area actually laid down, Season 1903-1904.						Increase or Decrease for present Season 1904-1905. * Denotes Decrease.					
	Wheat.			Oats.			Wheat.			Oats.			Wheat.			Oats.		
	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.
	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.
SOUTH-WESTERN PORTION.																		
NORTHAMPTON—																		
Northampton	3,567	1,907	1,660	489½	234	255½	2,705	1,160	1,545	383¾	169½	214¼	862	747	115	105¾	64½	41¼
Geraldton (part of)	368	169	199	80	32	48	327	187	140	72	47	25	41	*18	59	8	*15	23
Total Northampton ...	3,935	2,076	1,859	569½	266	303½	3,032	1,347	1,685	455¾	216½	239¼	903	729	174	113¾	49½	64¼
VICTORIA—																		
Geraldton (part of)	3,123	1,523	1,600	761½	168	593½	2,826½	1,281½	1,545	805	253	552	296½	241½	55	*43½	*85	41½
Greenough	10,074½	5,040	5,034½	854	389	465	10,472	5,718½	4,753½	1,191½	400	791½	*397½	*678½	281	*337½	*11	*326½
Dongara	5,440¾	3,321	2,119¾	727	460	267	6,116¾	3,860½	2,256¼	416	269	147	*676	*539½	*136½	311	191	120
Mullewa	22	...	22	20	...	20	22	...	22	20	...	20	...	...	...	...	...	...
Mingenew	1,055	725	330	78	38	40	872	525	347	108	60	48	183	200	*17	*30	*22	*8
Total Victoria	19,715¼	10,609	9,106¼	2,440½	1,055	1,385½	20,309¼	11,385½	8,923¾	2,540½	982	1,558½	*594	*776½	182½	*100	73	*173
SWAN—																		
Swan	71	25	46	578	10	568	74	8	66	658	...	658	*3	17	*20	*80	10	*90
Guildford	213¼	51	162¼	510	34	476	188¾	40½	148¼	972	12	960	24½	10½	14	*462	22	*484
Midland Junction	733½	265	468½	889	119	770	902	232	670	1,197½	100	1,097½	*168½	33	*201½	*308½	19	*327½
Mundaring	321	194½	126½	184½	24	160½	240½	116	124½	232	...	232	80½	78½	2	*47½	24	*71½
Gingin	2,896	2,157	739	2,325	691½	1,633½	2,428	1,502½	925½	2,711	510	2,201	468	654½	*186½	*386	181½	*567½
Moora	5,450	3,185	2,265	859½	482½	377	5,175½	2,992½	2,183	1,054¾	516½	538¼	274½	192½	82	*195¼	*34	*161¼
Total Swan	9,684¾	5,877½	3,807¼	5,346	1,361	3,985	9,008¾	4,891½	4,117¼	6,825¼	1,138½	5686¾	676	986	*310	*1,479¼	222½	*1,701¾
NORTHAM—																		
Northam	51,400½	27,644	23,756½	3,047	1,923	1,124	45,509	24,897½	20,611½	3,868½	2,009½	1,859	5,891½	2,746½	3,145	*821½	*86½	*735
Newcastle	26,011½	18,437	7,574½	3,457	2,241	1,216	23,385	15,906	7,479	3,116½	1,985	1,131½	2,626½	2,531	95½	340½	256	84½
Total Northam	77,412	46,081	31,331	6,504	4,164	2,340	68,894	40,803½	28,090½	6,985	3,994½	2,990½	8,518	5,277½	3,240½	*481	169½	*650½
YORK—																		
York	31,111½	20,162¼	10,949¼	1,495	1,003½	491½	26,825¼	18,056¾	8,768½	1,364¼	856¾	507½	4,286¼	2,105½	2,180¾	130¾	146¾	*16
Beverley	33,344	24,340½	9,003½	1,929	1,370½	558½	26,417	19,810½	6,606½	1,658	967½	690½	6,927	4,530	2,397	271	403	*132
Total York	64,455½	44,502¾	19,952¾	3,424	2,374	1,050	53,242¼	37,867¼	15,375	3,022¼	1,824¼	1,198	11,213¼	6,635½	4,577¾	401¾	549¾	*148

PERTH—																		
Metropolitan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
West Perth	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Subiaco	2½	...	2½	22	...	22	20	...	20	22	...	22	*17½	...	*17½	...	...	...
Leederville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
North Perth and Bayswater	...	...	...	5	...	5	3	...	3	10	1	9	*3	...	*3	*5	*1	*4
Highgate Hill...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Victoria Park	24	...	24	68	...	68	10¼	...	10¼	72¼	...	72¼	13¾	...	13¾	*4¼	...	*4¼
Wanneroo	7	...	7	12	...	12	1	...	1	8	...	8	6	...	6	4	...	4
Kelmscott	624½	90	534½	371	46	325	536¾	42	494¾	575¾	43	532¾	87¾	48	39¾	*204¾	3	*207¾
Claremont	1	...	1	1	...	1	¾	...	¾	1	...	1	¼	...	¼	...	...	...
Total Perth	659	90	569	479	46	433	571¾	42	529¾	689	44	645	87¼	48	39¼	*210	2	*212
FREMANTLE—																		
Beaconsfield	30½	...	30½	24¼	...	24¼	18½	...	18½	44¼	...	44¼	12	...	12	*20	...	*20
North Fremantle	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rockingham	35	5	30	91	...	91	35	5	30	91	...	91	...	...	...	...	...	...
Jandakot	5	...	5	...	...	...	5	...	5	...	...	...	...	...	...	...	...	...
Fremantle	107¾	1½	106¼	171½	...	171½	163¾	1½	162¼	135½	...	135½	*56	...	*56	36	...	36
Total Fremantle... ...	178¼	6½	171¾	286¾	...	286¾	222¼	6½	215¾	270¾	...	270¾	*44	...	*44	16	...	16
MURRAY—																		
Pinjarra	636	78	558	950	86	864	699¾	150¼	549½	1,371¼	65	1,306¼	*63¾	*72¼	8½	*421¼	21	*442¼
Jarrahdale	304½	52	252½	481½	22	459½	253½	6	247½	485	10	475	51	46	5	*3½	12	*15½
Waroona	225	57	168	920½	23	897½	154	23	131	1,084	8	1,076	71	34	37	*163½	15	*178½
Total Murray	1,165½	187	978½	2,352	131	2,221	1,107¼	179¼	928	2,940¼	83	2,857¼	58¼	7¾	50½	*588¼	48	*636¼
WELLINGTON—																		
Bunbury	1,034½	540	494½	3,698¼	387½	3,311	1,185½	455¾	729¾	4,493¾	470½	4,023¼	*151	84½	*235¼	*795¼	*83	*712¼
Yarloop	250	119	131	1,037½	74	963½	249	113	136	1,386½	167	1,219½	1	6	*5	*349	*93	*256
Collie (part of)	46	25	21	43½	1	42½	51	30	21	35¼	¾	34½	*5	*5	...	8¼	¼	8
Donnybrook (part of) ...	57½	43	14½	208	6½	201½	67¼	48	19¼	290¾	16¼	274½	*9¾	*5	*4¾	82¾	*9¾	*73
Total Wellington ...	1,388	727	661	4,987½	469	4,518½	1,552¾	646¾	906	6,206¼	654½	5,551¾	*164¾	80¼	*245	*1,218¾	*185½	*1,033¼
COLLIE—																		
Collie (part of)	13	4	9	172	...	172	163	22	141	123	20	103	*150	*18	*132	49	*20	69
WILLIAMS—																		
Williams	3,047	2,169	878	475	219	256	3,099	2,027	1,072	621¾	449½	172¼	*52	142	*194	*146¾	*230½	83¾
Narrogin	12,615	9,790½	2,824½	1,166	604	562	9,825¾	7,693¼	2,132½	1,266	819	447	2,789¼	2,097¼	692	*100	*215	115
Total Williams	15,662	11,959½	3,702½	1,641	823	818	12,924¾	9,720¼	3,204½	1,887¾	1,268½	619¼	2,737¼	2,239¼	498	*246¾	*445½	198¾

COMPARATIVE STATEMENT showing the Areas actually laid down with WHEAT and OATS for GRAIN and HAY, etc.—continued.

Magisterial and Police Districts.	Estimated Area laid down, Season 1904-1905.						Area actually laid down, Season 1903-1904.						Increase or Decrease for present Season 1904-1905. * Denotes Decrease.					
	Wheat.			Oats.			Wheat.			Oats.			Wheat.			Oats.		
	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Hay.	Total Area.	For Grain.	For Oats.	Total Area.	For Grain.	For Hay.
	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres	acres.	acres.
KATANNING—																		
Katanning	26,710½	22,197	4,513½	3,413	1,503	1,910	19,432½	14,514	4,918½	3,724½	1,622	2,102½	7,278	7,683	*405	*311½	*119	*192½
Wagin	16,750	13,300	3,450	2,733	1,356	1,377	13,145½	9,315	3,830½	2,394½	1,172½	1,222	3,604½	3,985	*380½	338½	183	155
Broomehill	5,951	4,160	1,791	1,491	549	942	5,441½	3,516½	1,925	1,158	526	632	509½	643½	*134	333	23	310
Kojonup	2,876	2,403	473	1,071	680	391	2,499	2,092	407	889	412	477	377	311	66	182	268	*86
Total Katanning ...	52,287½	42,060	10,227½	8,708	4,088	4,620	40,518½	29,437½	11,081	8,166	3,732½	4,433½	11,769	12,622½	*853½	542	355½	186½
BLACKWOOD—																		
Bridgetown	668½	428	240½	1,252½	305	947½	887	491	396	1,170¼	345	825¼	*218½	*63	155	82¼	*40	122¼
Donnybrook (part of) ...	34	20	14	520	84	436	73	22	51	494	53	441	*39	*2	*37	26	31	*5
Greenbushes (part of) ...	99½	29	70½	471½	5	466½	64½	11	53½	487¾	2	485¾	35	18	17	*16¼	3	*19¼
Total Blackwood ...	802	477	325	2,244	394	1,850	1,024½	524	500½	2,152	400	1,752	*222½	*47	*175½	92	*6	98
SUSSEX—																		
Busselton	268½	112½	156	543½	13	530½	356¼	94½	261¾	628¾	23	605¾	*87¾	18	*105¾	*85¼	*10	*75¼
Hamelin	2	...	2	101½	1½	100	2	...	2	117¾	1½	116¼	...	...	...	*16¼	...	*16¼
Greenbushes (part of) ...	11	1	10	11	...	11	11	1	10	11	...	11	...	...	...	...	...	...
Total Sussex	281½	113½	168	656	14½	641½	369¼	95½	273¾	757½	24½	733	*87¾	18	*105¾	*101½	*10	*91½
PLANTAGENET—																		
Albany	220	55	165	178	20	158	115	5	110	130	1	129	105	50	55	48	19	29
Mount Barker...	789¾	1,052	737¾	592¼	129	463¼	1,726¾	941	785¾	408¾	183	225¾	63	111	*48	183½	*54	237½
Total Plantagenet ...	2,009¾	1,107	902¾	770¼	149	621¼	1,841¾	946	895¾	538¾	184	354¾	168	161	7	231½	*35	266½
PHILLIPS RIVER—																		
Ravensthorpe	358			111	...	111	313½	20	293½	14	...	14	44½	50	*5½	97	...	97
DUNDAS—																		
Dundas	749	60	89	14	...	14	724	...	724	...	...	...	25	60	*35	14	...	14
ESPERANCE—																		
Esperance	200½	20	180½	21½	3	18½	185¼	...	185¼	85½	1	84½	15¼	20	*4¾	*64	2	*66
GRAND TOTAL, WESTERN AUSTRALIA	250,956½	166,027¾	84,928¾	40,727	15,337½	25,389½	216,004¾	137,934½	78,070¼	43,659½	14,567¾	29,091¾	34,951¾	28,093¼	6,858½	*2,932½	769¾	*3,702¼

Government Statistician's Office,
Perth, Western Australia, 26th August, 1904.

MALCOLM A. C. FRASER,
Government Statistician.

rS for GRAIN and HAY, etc.—continued.

Magisteri	1903-1904. Oats. For Grain.	For Hay.	Increase or Decrease for present Season 1904-1905. * Denotes Decrease. Wheat. Total Area.	For Grain.	For Oats.	Oats. Total Area.	For Grain.	For Hay.
	acres.	acres.	acres.	acres.	acres.	acres	acres.	acres.
KATANNING								
Katann	1,622	2,102½	7,278	7,683	*405	*311½	*119	*192½
Wagin	1,172½	1,222	3,604½	3,985	*380½	338½	183	155
Broome	526	632	509½	643½	*134	333	23	310
Kojonu	412	477	377	311	66	182	268	*86
Tot	3,732½	4,433½	11,769	12,622½	*853½	542	355½	186½
BLACKWOOD								
Bridget	345	825¼	*218½	*63	155	82¼	*40	122¼
Donnyb	53	441	*39	*2	*37	26	31	*5
Greenb	2	485¾	35	18	17	*16¼	3	*19¼
Tot	400	1,752	*222½	*47	*175½	92	*6	98
SUSSEX—								
Busselt	23	605¾	*87¾	18	*105¾	*85¼	*10	*75¼
Hameli	1½	116¼	...	...	...	*16¼	...	*16¼
Greenb	...	11	...	...	...	...	...	...
Tot	24½	733	*87¾	18	*105¾	*101½	*10	*91½
PLANTAGEN								
Albany	1	129	105	50	55	48	19	29
Mount	183	225¾	63	111	*48	183½	*54	237½
Tot	184	354¾	168	161	7	231½	*35	266½
PHILLIPS R Ravens	...	14	44½	50	*5½	97	...	97
DUNDAS— Dundas	...	...	25	60	*35	14	...	14
ESPERANCE— Esperan	1	84½	15¼	20	*4¾	*64	2	*66
GRAN A	14,567¾	29,091¾	34,951¾	28,093¼	6,858½	*2,932½	769¾	*3,702¼

Governmer
Per

MALCOLM A. C. FRASER,
Government Statistician.

DALGETY'S MONTHLY REPORT.

Messrs. Dalgety & Co., Limited, report as follows in connection with their produce markets at Perth and Fremantle for the month ended 7th September:—

Wheat.—The recent excited London and American markets are quieter, but still firm in tone. Wheat is quoting in Melbourne at 3s. 5d. per bushel, at which price business is being transacted. Values for West Australian wheat have during the month undergone a considerable improvement. At the end of July milling wheat was selling at Perth and Fremantle at 3s. per bushel, whilst business had been transacted in the country at as low as 2s. 10d. and 2s. 11d. Since that time there has been a renewed buying inquiry on behalf of millers and others. Farmers are still holders of fair quantities of wheat, but are not so anxious to realise, many preferring to risk the market a little longer; doubtless their reason for this action is that improved values on foreign markets are being reflected locally, and the unsatisfactory condition of crops in many districts owing to the recent heavy rains. However, this phase of the question is not nearly so acute, as the recent weather has been very helpful to those crops which have been looked upon as too backward. The past month provided an entirely new feature in the wheat-growing industry of this State. We refer to the shipment of W.A. wheat that we made as agents for a number of growers per s.s. "Essex" to Liverpool. This shipment consisted of 2,280 bags, and was the first to leave this State.

At the end of August the market at Perth and Fremantle was very strong at 3s. 5d. per bushel f.o.r., but during the last few days values have weakened, and 3s. 4d. is the best price obtainable at either Perth or Fremantle. During August 70 tons of wheat reached Perth, and 300 tons reached Fremantle, of which we handled 255 tons. So far, in September, only a small quantity of wheat has come forward.

Chaff.—During August supplies of chaff generally were light, resulting in a firm market. Thanks to the assistance of members of the trade, we have been enabled to submit the following particulars as to chaff consumed and in stock at Perth and Fremantle during August:—

Stocks on hand at Perth, 31st July, 1904	550	tons
Arrivals at Perth during August	1,360	,,
	1,910	,,
Less stocks on hand at Perth, 31st August, 1904 ...	606	,,
	1,304	,,
Less reconsigned to Fremantle	170	,,
Consumption at Perth, August	1,134	,,
Stocks on hand at Fremantle, 31st July	160	,,
Arrivals during August from country	282	,,
Arrivals during August from Perth	170	,,
	612	,,
Less stocks on hand at Fremantle, 31st August, 1904 ...	180	,,
Consumption at Fremantle during August	432	,,
Total chaff consigned and distributed at Perth and Fremantle during August	1,566	,,
Stocks at Perth and Fremantle, 31st August, 1904 ...	786	,,

We sold at Perth and Fremantle, by auction, 550 tons, in addition to chaff disposed of privately and in Kalgoorlie. At the end of August prime chaff was in short supply, and all truck-loads of first-class feed were sold at full market rates, which were, on 31st August, as follows :—

Prime green wheaten, extra quality (good demand), £4 10s. to £4 12s. 6d.

Prime green wheaten, from £4 5s. to £4 7s. 6d. per ton.

Good quality wheaten (good demand), from £3 15s. to £4.

Medium wheaten, from £3 per ton upwards.

Inferior samples of wheaten (dull of sale), from 30s. per ton.

Prime green oaten, none forward.

Good quality oaten (fair demand), £3 5s. to £3 10s. per ton.

However, this position has undergone much change during the first week of September. On Saturday and Monday, the 3rd and 5th insts., the arrivals were very heavy, being much in excess of offerings forward for some time past. This had a depressing effect on values, which immediately declined, and then the market was lifeless, buyers showing no desire to operate except for specially prime samples. However, this position is not likely to last long, as Kalgoorlie supplies have been very light, and that market is now much better than Perth or Fremantle, naturally supplies will be diverted to that market. As an indication of this, arrivals on Tuesday and Wednesday at Perth and Fremantle have decreased, but it is yet too soon for the market to show any alteration in values, and on that account ruling rates at the time of this report are as follows :—

Prime green wheaten (fair demand), £4 to £4 5s. per ton; the latter price being maintained with difficulty.

Good quality wheaten, from £3 10s. to £3 17s. 6d. (steady demand).

Inferior wheaten, unsaleable.

Medium wheaten, from £2 5s. to £3 5s. per ton, according to sample (dragging sale).

There is a good demand for good prime oaten, and could recommend consignments of a few trucks. Latterly supplies have been drawn from Meckering, Northam, York, Greenhills, Katanning, and Midland districts; the best samples coming from Beverley, Pingelly, and Moora, whilst heaviest quantities are being consigned from Northam and surrounding districts.

Hay.—Business in this line is dull, stock shippers have practically contracted for all this season's requirements, and seem to be disinclined to make further purchases now that the close of the North-West season is in view. Nominal value, from £3 5s. to £3 7s. 6d. per ton Fremantle. During August 350 tons of hay reached Fremantle to different consignees.

Straw.—Very little has come forward to either Perth or Fremantle during the past fortnight, and a few trucks of well-pressed straw would sell readily enough at market rates, which are from 25s. to £2 per ton, f.o.r. Perth and Fremantle, according to sample.

Algerian Oats.—Very few locals now available for sale. As values in the country are better than ruling rates at either Perth or Fremantle, no consignments are likely to come forward to these markets. We have an inquiry for local Algerians, for which we could secure slightly advanced rates. There have been heavy importations of Algerians from Victoria. Stocks on spot at Fremantle are heavy.

KALGOORLE MARKET.

Average arrivals have been of a light description during the past week, although on one or two days there were fairly heavy yardings. The demand throughout, as far as prime chaff is concerned, has been consistently good. During the past fortnight we have placed several trucks of oaten hay and chaff for racing stables at good prices. The requirements, however, are all filled for the present meeting.

Present values of chaff are as follows:—

Prime green wheaten (excellent demand), £5 5s. per ton.

Good qualities, up to £4 15s. per ton (good demand).

Poor to medium grades, ranging from £3 15s. to £4 10s., according to quality. This class of chaff does not meet with a ready sale.

No extra prime chaff is to hand lately.

STOCK AND STATION REPORT.

Stud Stock.—We would draw the attention of all those in want of good merino or Shropshire rams to the sale we are shortly holding (through our York office) at York, Northam, and Beverley, when we will sell by auction a fine draft of selected rams direct from South Australia, bred by J. H. Angas, Murray's, Nalpa, Kodlunga, Wotalunga, etc. These are very fine rams, and will be sold singly to give buyers a fair chance. Buyers should write our York office *re* dates of sales.

YORK.

We held our fortnightly sale at York on Wednesday, 24th inst., when there was a good yarding and a full attendance of buyers. Fat sheep sold at from 26s. 6d. to 27s. 6d.; store wethers from 17s. 6d. to 20s. 3d., and a good line of ewes with lambs at 26s. 6d. Porkers sold readily at from 30s. to 39s. 6d.; bacon pigs to £3 15s. 6d.; slips from 12s. to 20s., and two young Berkshire boars at £2 2s. each. Fowls realised from 5s. 1d. to 5s. 10d. per pair. Medium draught horses sold at up to £38 10s., and a Clydesdale stallion at £78.

BEVERLEY.

At our Beverley sale there was a good attendance of buyers, and the yards were cleared at satisfactory prices. Fat lambs sold at 13s. 10d. Fat steers at £7 16s. A young Jersey bull at £5. Porkers were in keen demand at from 28s. 6d. to 43s. 6d.; bacon pigs, from £2 17s. 6d. to £4 1s. Medium draught horses realised from £27 to £33 10s; heavy draughts to £54; light harness horses at £9 to £19, and a very good Clydesdale stallion at £85. Ducks sold at 8s. 11d. per pair, and fowls at 5s. 3d. per pair.

HIDES, SKINS, TALLOW, ETC.

Messrs. Dalgety and Co., Limited, report having held their usual weekly sale on Friday, 2nd September.

Sheepskins.—Only moderate supplies forward, and these met a dragging market, late values being maintained with difficulty. Super merino to full

wool, to 7¼d.; good merino three-quarter to full wool, 6¾d. to 7d.; medium three-quarter to full wool, 6d. to 6½d.; good merino quarter to half wool, 6d. to 6½d.; medium merino quarter to half wool, 5d to 5½d.; fine crossbred three-quarter to full wool, 6½d. to 7d.; fine crossbred half to full wool, 5¼d. to 6¼d.; medium three-quarter to full wool, 6d. to 6¼d.; coarse, 5¾d. to 6d.; pelts, 3½d. to 4½d. In all cases where pelts of above are sun-dried, weevil-eaten, torn, or perished prices are from 1d. to 2d. below quotations.

Hides.—We submitted an attractive catalogue. This market is very unsettled, and the bulk of offerings were withdrawn, and a fall of ⅛d. to ¼d. per lb. in value must be reported. Heavies (special), to 4½d.; heavies, 4d. to 4⅛d.; medium and light, 4d. to 4¼d.; dry, 4¾d. (nominal); damaged and cut, 3½d. to 3¾d.

Calfskins.—Sound and good-conditioned, to 2s. 6d. each; cut and damaged, 1s. 4d. to 2s. each. Attention to flaying and preparation for market is very necessary, and results in enhanced values.

Kangaroo and Furred Skins.—Smaller supplies of kangaroo skins to hand, and we effected a ready clearance on the lower basis of values reported last week. ¾lb. to 1lb. average: blue skins, 2s. 4d. to 2s. 8d.; red, 2s. to 2s. 3d. (nominal). ½lb. average: blue, 1s. 5d. to 1s. 8d.; red, 1s. 3d. to 1s. 6d. 1½lb. to 2lb. average: blue, 1s. 10d. to 2s 3d.; red, 1s. 9d. to 2s. Damaged lines: blue, 1s. to 1s. 8d.; red, 1s. to 1s. 6d. Euro skins, 1s. to 1s. 7d. Brush kangaroo, 1s. 3d.

Opossum Skins.—We offered an average catalogue to good competition and unchanged values. Good greys and reds, 5s. 6d. to 6s. 6d. per dozen average; medium greys and reds, 4s. 6d. to 5s.; good blacks, 16s. to 18s.; inferior blacks, 13s. 6d.

Tallow.—None forward, and we quote nominally: Medium mixed (in casks), to 19s. per cwt.; inferior (in casks), 17s. 6d. to 18s. 6d.; tins and oddments, 16s. to 18s.

Horns, Hair, etc.—Some fair lines were included in to-day's offerings, and these were in good demand and sold readily at quotations. Horns, large and fresh, 35s. to 42s. per 100; small and fresh, 12s. to 13s. per 100; stale and perished, 5s. per 100; very small, 1s. per 100. Rough bones, 3s. 6d. per cwt. Horsehair, 1s. 2d. per lb. Cowhair, 6d. per lb.

GARDEN NOTES FOR OCTOBER.

By PERCY G. WICKEN.

The month of September being the best month for planting out most of the summer-growing crops, those who followed last month's notes should have planted out a good assortment of vegetable in the garden. Those, however, who, through the weather being unfavourable or through other circumstances, were prevented from doing so, should lose no time in pushing on with the work as early as possible this month, as in our dry summer climate every day is a consideration at this time of the year. All plants may be safely planted out in the open in all parts of the State with very little risk from frost; although frosts this month sometimes occur, the risk is not great. At the present time—which is some weeks ahead of the time when these notes appear—the prospects seem very favourable for a good year in the garden, and vegetables of all kinds should be plentiful. Towards the end of the month some hot, drying days are likely to occur, and attention should be paid to keeping the surface soil well stirred either by means of the hand hoe or the Planet Junr. cultivators, and thereby conserve as much as possible of the moisture in the soil. Weeds are also likely to be troublesome, and should be cut down as soon as they appear, and on no account should they be allowed to come to maturity and scatter their seed to grow again the following season. Any plants that seem at all backward should be helped along by the application of a little liquid manure applied in small quantities around the roots. Also, keep a lookout for cut worms and other insect pests. Cut worms, which do considerable damage in a garden, can generally be found by scratching a little of the soil away round the stem of the young plant, and the grubs will be found in the ground. They mostly come out at night, and eat a ring round the stalk of the plant, causing it to break down or wither off. The best remedy is to poison them with a little poisoned pollard placed near the stems attacked, care being taken to place it out of the reach of any fowls or livestock.

ARTICHOKES (Jerusalem).—If not already sown, they should be planted at once, the ground being well manured, and the tubers not cut into too small pieces.

BEANS (French or Kidney, Butter, Scarlet Runners, Haricot beans, and Snake beans) are some of our best and most prolific summer vegetables, and should be planted in all localities, and in large quantities, this month. They should be planted in drills from two to four feet apart, and should be liberally manured with superphosphate and potash. The dwarf varieties will grow on the ground, but the running varieties will yield better if staked.

BEANS (Lima).—These beans make an excellent vegetable, and are worthy of a place in every garden; they stand the dry weather well, and give an excellent yield. The pod is useless, the seed being eaten in the same manner as peas. This is the best month for planting. Some varieties are great climbers, and require to be trellised; others are dwarf varieties. The "Black Pole" Lima is the most prolific grower, but the "King of the Garden" Lima is perhaps the best for table.

BEET (Red).—A few rows can be sown to keep up a succession. The Globe variety is a good one to sow at the present time.

BEET (Silver).—A little seed may be sown to keep up a supply. This is a splendid plant for producing a supply of green leaves during the summer. The outside leaves are cut off and used as spinach. The soil should be liberally manured.

CABBAGE.—Plant out any young plants you may have available; they will probably want shading for a day or two after planting.

CARROT.—Plant out a few rows to keep up a succession; those already up will require weeding and thinning out. The Shorthorn is a good variety to sow now.

CELERY is an acceptable vegetable during the hot weather. All young plants should be transplanted into trenches, and a little more seed sown to keep up a supply. The more forward plants should be hilled up with earth, to cause them to become bleached.

CUCUMBERS may now be sown in the open in all parts. The hills should be dug up and well manured, and from three to four plants allowed to grow on each hill. The hills require to be kept free from weeds, and the surface soil well hoed.

EGG PLANTS.—Seed may be sown in a sheltered bed or in a box, and the plants put out as soon as large enough.

LEEK.—A little seed may be sown to keep up a supply.

LETTUCE.—Plant out any young plants you may have, and sow a little seed.

MELONS.—If not already sown, a good supply of these plants should be put out. Both rock, water, and preserving melons should be planted out this month, but they should not be sown near one another, as they will cross-fertilise, and the fruits become useless for market purposes.

OPRAS.—A few seeds may be sown. The seeds are useful for putting into pickles and for flavouring; a few plants make an addition to the garden.

ONIONS.—Plant out any seedlings, and sow a little seed for future use.

PARSNIPS.—Plant out a little seed to keep up a supply.

POTATOES, if not already sown, should be planted out at once in a moist locality, and care should be taken that the seed is clean and free from scab. Too many eyes should not be left on each piece.

PUMPKINS AND SQUASHES should be planted out largely during this month; they require about the same treatment as melons. They make a desirable vegetable to grow, as if stored away in a fairly dry place they will keep for a long time, and be a welcome vegetable in the autumn when other vegetables are scarce.

SWEET POTATOES.—Plenty of shoots or cuttings from the seed-bed should now be available, and these should be planted out as soon as possible; they will then make some root-growth before the weather becomes hot and dry. They are prolific bearers, and the potatoes are acceptable for the table.

TOMATOES.—In the early districts the early varieties of the plant will be bearing fruit. The plants can be planted in the open now in nearly all parts of the State. This is a very desirable plant to put out in all the odd corners and spare places in the garden, as the fruit is always welcome. All plants already up may be transplanted, and a further quantity of seed sown for a future supply.

TUMERIC is useful for the flavouring of soups, and a few roots are an addition to the vegetable garden. It is very similar in

habit of growth to ginger, and is often mistaken for it. A piece of the root is planted the same as potatoes. It should be sown this month.

FARM.—Work on the farm, except for those who have plenty of land to fallow—and most new settlers have not—is rather slack at the present time, and advantage should be taken of any fine weather to get all the burning-off possible done before the close season. Also, to look round all the harvesting machinery to see that it is all in good order, and obtain any duplicate parts that may be required. Towards the end of the month the grass will be getting dry, and wherever there is danger of fires a fire-break should be ploughed round the crops, as well as around any grass paddocks which are likely to be in danger. There is a good deal to attend to among stock at this period. A number of settlers will be thinking of sending some of their stock to the local agricultural shows, and to get them in condition to catch the eye of the judges plenty of elbow-grease applied to the end of the curry-comb and dandruff brush is necessary, as well as careful attention to the matter of feeding, so as to have the stock in the best condition. Many people think it is a waste of time to groom a cow or bull, but if the animal is to appear at its best it must be done. Shearing will be in swing in many districts, and where a number of sheep are kept, wool-classing and baling will take up some of the time. As the grass becomes dry, in districts troubled with poison the young poison plants begin to grow, and being young and succulent offer a tempting bite to the stock, with the usual disastrous results; therefore, at this period the paddocks should be gone over, and all the poison plants which can be found should be hoed out and burnt.

The following summer crops can all be sown during this month, the earlier the better:—Maize, melons, pumpkins, sorghum, cow-pea, soy beans, mangels, sugar-beets, and millet.

Now that the crops are making good growth, and before harvesting, is a good time to pay a visit to the Experimental Farms. As will be seen by a notice in the first pages of the *Journal*, the trains are met on certain days of the week and visitors driven out to the farms. Apart from this, visitors are welcome and invited to visit the farms at all times except Sunday, and to see the results of the experiments with the various crops, to inspect the stock, and to obtain any information on agricultural subjects which the manager is able to give them. Also, eggs for setting and young stock of different kinds are available at a reasonable rate, as will be seen by the advertisement in this issue. Students are also received at these farms for a course of instruction in practical farming, for which application should be made to the Acting Director of Agriculture, Perth.

THE CLIMATE OF WESTERN AUSTRALIA DURING AUGUST, 1904.

The usual succession of "highs" and "lows" have been passing Eastwards during the month, the most severe storm being the one at the beginning which brought very heavy rain in the neighbourhood of Perth, and rough squally weather on the Coast; otherwise the rainfall in the S.W., from Perth Southwards, and over the Goldfields was about an average. From Perth Northwards to Sharks Bay, the fall was below the average, and throughout the tropics none fell except a little between Nullagine and the Coast, on the first of the month.

Both the atmospheric pressure and temperature were normal throughout the State. In the Kimberley district, day temperatures exceeded 90° on several occasions, but inland in the S.W., and on the Coolgardie Goldfields the following table shows that low temperatures on the surface of the ground were still recorded:—

Station.	Mean.	Lowest.	Date.
Peak Hill	44·0	35·4	1
Cue	42 3	37·0	5
Coolgardie	35·6	27·6	14
Southern Cross	37·3	30·0	20
Walebing	34·6	27·0	14
York	37·8	31·0	18
Perth Observatory	44·4	37·7	18
Wandering	31·7	22·0	12
Narrogin	36·7	28·0	12, 18
Katanning	35·2	26·0	18
Bridgetown	37·9	30·0	11
Karridale	43·5	28·8	20

The Climate of Western Australia during August, 1904.

Region	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. August, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	30·014	30·006	30·167	29·866	89·0	67·3	78·2	93·4	62·8	89·4	69·1	96·8	56·2	*Nil*	2917
	Derby ...	30·018	30·005	30·147	29·886	87·4	58·9	73·2	93·0	53·8	89·1	59·6	98·6	49·5	*Nil*	3182
	Broome ...	30·021	30·016	30·171	29·902	84·4	61·2	72·8	91·2	53·0	85·4	58·2	98·8	43·0	*Nil*	2353
	Condon ...	30·051	30·052	30·197	29·895	79·5	54·8	67·2	88·1	45·2	80·9	52·0	95·2	38·0	60	621
	Cossack ...	30·070	30·064	30·215	29·891	80·8	57·9	69·4	90·2	54·8	80·7	55·9	92·2	45·8	*Nil*	1138
	Onslow ...	30·094	30·068	30·239	29·957	78·1	54·2	66·6	85·0	51·0	79·1	52·6	90·5	40·0	1	1470
	Carnarvon ...	30·132	30·112	30·299	29·947	73·3	51·9	62·6	85·3	44·3	72·7	52·2	90·2	40·5	14	1015
	Hamelin Pool...	30·137	30·208	30·347	29·913	71·6	48·7	60·2	79·4	43·4	71·4	48·2	83·0	35·7	34	876
	Geraldton ...	30·153	30·127	30·401	29·877	69·5	51·1	60·3	79·5	44·0	69·1	50·4	84·8	38·9	139	1223
Inland:	Hall's Creek ...	30·102	30·040	30·278	29·872	83·9	48·4	66·2	90·0	38·5	86·0	51·7	95·2	32·8	*Nil*	2791
	Marble Bar* ...	...	...	...	...	83·2	57·5	70·4	90·0	52·0	85·6	52·9	95·0	39·0	78	482
	Nullagine ...	30·094	30·068	30·321	29·860	79·6	50·3	65·0	86·5	42·0	79·5	46·8	92·0	30·1	123	832
	Peak Hill ...	30·150	30·108	30·432	29·890	69·5	48·6	59·0	80·0	42·5	70·4	47·0	83·8	36·4	*Nil*	757
	Wiluna ...	30·158	30·112	30·483	29·780	68·4	45·1	56·8	79·0	38·7	70·9	42·3	85·8	31·3	22	715
	Cue	30·162	30·132	30·433	29·879	67·9	45·6	56·8	79·1	41·0	69·5	45·9	86·0	31·0	16	782
	Yalgoo ...	30·154	30·124	30·455	29·869	67·7	45·8	56·8	79·0	40·0	68·2	44·1	85·3	31·5	25	551
	Lawlers ...	30·168	30·128	30·535	29·779	67·1	45·3	56·2	78·0	39·0	68·0	44·6	85·2	28·2	9	672
	Laverton * ...	30·160	30·149	30·542	29·708	67·5	43·5	55·5	79·5	36·8	68·4	43·3	87·1	27·0	18	689
	Menzies ...	30·155	30·132	30·565	29·745	66·6	44·6	55·6	77·9	36·8	65·7	44·5	83·8	29·7	52	545
	Kanowna ...	...	...	...	...	65·9	44·7	55·3	76·8	35·0	65·5	41·7	76·3	34·3	66	
	Kalgoorlie ...	30·154	30·136	30·568	29·642	66·2	43·8	55·0	77·0	38·2	65·1	44·6	82·0	34·0	25	566
	Coolgardie ...	30·155	30·133	30·585	29·645	65·3	42·2	53·8	76·0	35·6	64·9	43·5	81·0	31·2	24	654
	Southern Cross	30·130	30·116	30·543	29·747	66·3	40·1	53·2	75·0	30·0	64·9	41·1	82·0	25·0	59	993
	Walebing ...	...	...	...	...	63·4	41·0	52·2	73·8	33·0	65·2	41·8	78·9	31·4	183	1658
	Northam ...	...	...	...	...	63·9	41·1	52·5	78·0	34·0	66·5	40·0	80·1	31·8	214	1777
	York	30·150	30·127	30·534	29·800	64·8	40·9	52·8	76·0	32·6	64·4	41·3	79·1	29·0	268	1679
	Guildford* ...	...	...	...	...	66·5	47·0	56·8	76·4	39·8	67·0	43·6	81·6	30·2	360	2613

* Averages for three years only.

The Climate of Western Australia during August, 1904—*continued*.

Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
					August, 1904.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens ...	30·148	30·112	30·577	29·684	65·5	50·1	57·8	76·0	44·0	65·2	47·1	83·5	33·6	584	2733
Perth Observatory	30·156	30·122	30·530	29·682	64·8	48·7	56·8	75·3	43·3	64·1	47·9	80·4	37·5	534	2678
Fremantle ...	30·150	30·100	30·522	29·681	63·8	51·4	57·6	72·0	46·2	63·6	51·0	77·3	38·0	412	2480
Rottnest ...	...	30·090	...	...	...	...	...	...	...	63·2	53·4	76·2	36·0	...	...
Mandurah* ...	...	...	...	...	63·7	46·7	55·2	71·0	36·0	65·0	44·5	76·2	33·8	576	2941
Wandering ...	...	...	...	...	63·2	44·6	53·9	71·0	39·0	61·4	36·1	72·9	28·2	427	...
Narrogin State Farm	...	...	...	...	59·0	41·5	50·2	70·5	34·0	...	...	...	...	334	1753
Collie*	...	...	...	...	62·3	39·3	50·8	72·0	31·4	62·2	37·7	75·7	29·0	488	2656
Donnybrook ...	...	...	...	...	62·9	44·2	53·6	70·9	36·2	64·6	44·9	74·2	32·1	481	2727
Bunbury ...	30·145	30·111	30·465	29·685	66·4	47·6	57·0	67·5	40·0	63·9	46·9	75·5	33·0	405	2824
Busselton* ...	...	...	...	...	62·6	45·9	54·2	68·0	36·0	63·2	45·2	73·8	33·6	366	2397
Cape Naturaliste	30·113	...	30·492	29·624	61·0	51·1	56·0	68·0	41·2	...	...	...	...	428	2407
Bridgetown* ...	...	...	...	...	62·4	40·5	51·4	71·0	33·0	62·6	39·1	75·9	28·2	352	2227
Karridale ...	30·100	30·092	30·492	29·600	62·6	48·8	55·7	70·2	36·0	62·0	46·4	74·4	32·5	502	3191
Cape Leeuwin ...	30·089	30·043	30·494	29·349	62·3	53·6	58·0	70·8	46·5	61·8	52·5	72·3	43·8	359	2731
Katanning ...	30·114	30·102	30·540	29·674	60·5	41·8	51·2	71·2	33·0	60·2	41·3	75·1	30·8	247	1343
Albany	30·068	30·069	30·534	29·500	62·6	45·0	53·8	75·2	36·0	61·7	45·8	77·5	34·5	384	3172
Breaksea... ...	30·056	30·058	30·537	29·426	59·7	51·0	55·4	73·8	43·8	59·8	49·8	74·8	34·5	243	2407
Esperance ...	30·104	30·098	30·546	29·538	64·4	46·4	55·4	72·2	35·8	64·1	46·8	82·8	34·0	342	2182
Balladonia ...	30·152	30·154	30·615	29·622	65·0	41·0	53·0	74·9	30·9	65·3	42·0	83·0	31·9	97	663
Eyre	30·118	30·132	30·592	29·646	65·9	43·8	54·8	75·5	31·2	64·8	43·8	88·7	29·1	100	1049
INTER-STATE.															
Perth	30·156	30·122	30·530	29·682	64·8	48·7	56·8	75·3	43·3	64·1	47·9	80·4	37·5	534	2678
Adelaide	30·173	30·125	30·611	29·610	60·9	45·6	53·2	68·4	38·1	62·0	45·8	82·0	32·3	198	...
Melbourne	30·111	29·981	...	29·586	57·5	43·9	50·7	62·8	34·0	58·8	43·2	77·0	28·3	328	...
Sydney	30·160	30·100	30·450	29·690	62·0	47·0	54·5	71·0	42·0	62·2	47·6	82·0	36·8	133	4127
Cocos Island ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Averages for three years only.

The Observatory, Perth, September, 1904.

W. E. COOKE, Government Astronomer.

RAINFALL for July, 1904 (completed as far as possible), and for August, 1904 (principally from Telegraphic Reports).

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham ...	Nil	...	Nil	...
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	Nil	..	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	Nil	...
Hall's Creek ...	Nil	...	Nil	...
Nicholson Plains	...	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	...	...	...	...
Beagle Bay ...	Nil	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	Nil	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	Nil	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	232	2	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	191	5	Nil	...

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
North-West:				
Wallal	332	9	Nil	...
Condon	238	7	60	1
Pardoo	263	6	...	...
DeGrey River ...	325	8	...	...
Port Hedland ...	384	10	47	1
Boodarie ...	396	9	...	...
Warralong ...	274	8	...	...
Muccan	318	8	...	...
Ettrick	399	4	...	...
Mulgie	306	7	...	...
Eel Creek ...	310	6	...	...
Station Peak ...	408	9	136	2
Coongon... ...	354	7	...	...
Warrawagine ...	303	4	...	...
Bamboo Creek ...	326	7	81	1
Marble Bar ...	404	8	78	1
Warrawoona ...	442	7	121	1
Corunna Downs...	349	6	...	...
Nullagine ...	256	7	123	1
Mt. Edgar ...	612	8	...	4
Kerdiadary ...	560	5	...	...
Roy Hill... ...	348	7	...	...
Middle Creek ...	264	7	...	...
Mosquito Creek	398	7	...	...
Mulga Downs ...	420	6	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	668	9	...	...
Tambrey ...	644	9	...	...
Millstream ...	764	9	...	...
Yandyarra ...	411	7	...	...
Mallina	459	9	...	...
Whim Creek ...	501	11	3	1
Cooyapooya ...	507	8	...	...
Woodbrooke ...	634	8	...	...
Croydon	...	...	...	...

RAINFALL—*continued.*

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
North-West—*cont.*				
Balla Balla ...	412	11	...	...
Roebourne ...	377	8	Nil	...
Cossack	402	12	Nil	...
Fortescue ...	707	9	Nil	...
Mardie	...	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	656	9	...	...
Chinginarra ...	...	...	...	...
Onslow	836	9	1	1
Peedamullah ...	769	10	...	...
Red Hill	758	8	...	...
Mt. Mortimer ...	950	10	...	...
Peake Station ...	1092	10	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	827	10	...	...
Yanrey	...	...	...	...
Point Cloates ...	685	8	...	...
Gascoyne:				
Winning Pool ...	938	9	7	1
Coordalia ...	...	...	...	...
Towara	918	11	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	794	13	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	661	9	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	762	10	...	...
Yanyeareddy ...	872	9	...	...
Williambury ...	792	10	...	...
Booloogooroo ...	736	8	...	...
Wandagee ...	755	8	...	...
Minilya	702	10	...	...
Bernier Island ...	1093	11	...	...
Boolathana ...	744	12	...	...
Carnarvon ...	593	10	14	2
Brick House ...	673	11	...	...
Cooralya	...	...	...	...
Doorawarrah ...	602	11	...	...
Bintholya ...	500	11	...	...
Mungarra ...	632	9	...	...
Clifton Downs ...	...	..	...	...
Dairy Creek ...	790	9	...	...
Upper Clifton Downs	544	11	...	...

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Errivilla	...	...	...	...
Dirk Hartog Island	795	11	..	...
Sharks Bay ...	430	11	40	1
Kararang ...	372	11	...	...
Meedo	447	12	...	...
Tamala	...	...	...	...
Wooramel ...	638	12	59	5
Hamelin Pool ...	511	9	34	5
Byro	524	8	...	...
Yarra Yarra ...	671	8	...	...
Berringarra ...	515	7	...	...
Mt. Gould ...	371	10	..	...
Moorarie ...	374	10	...	...
Wandary... ...	380	8	...	...
Peak Hill ...	451	12	Nil	...
Horseshoe ...	463	12	4	1
Mt. Fraser ...	412	7	Ni	...
Abbotts	383	9	15	2
Belele	366	7	...	...
Mileura	409	9	...	...
Milly Milly ...	320	6	...	...
Manfred ...	451	10	...	...
New Forest ...	347	7	...	...
Woogorong ...	391	9	...	...
Boolardy ...	611	7	...	...
Twin Peaks ...	361	9	...	...
Billabalong ...	...	...	...	...
Wooleane ...	363	7	...	...
Murgoo	363	9	26	3
Yallalonga ...	336	8	...	...
Meka	272	6	...	...
Mt. Wittenoom ...	329	9	...	...
Nannine	412	7	24	2
Star of the East...	402	7	26	2
Annean	418	8	...	...
Coodardy ...	500	11	10	1
Cue	539	9	16	1
Day Dawn ...	481	8	29	3
Lake Austin ...	344	6	16	1
Lennonville ...	219	8	87	5
Mt. Magnet ...	234	8	84	4
Warracoothara ...	...	...	...	...
Challa	226	7	18	3
Youeragabbie ...	130	7	...	...
Murrum	174	5	...	...
Burnerbinmah ...	181	8	...	...

RAINFALL—*continued.*

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
GASCOYNE—*contd.*				
Barnong	417	9	...	...
Mellenbye ...	360	9	82	10
Yalgoo	212	9	25	4
Wagga Wagga ...	190	6	15	2
Gabyon	292	9	...	...
Wurarga ..	...	...	...	...
Muralgarra ...	178	5	...	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	410	10	...	...
Mt. View ...	377	10	...	...
Mumby	335	13	154	10
Yuin	312	7	...	...
Northampton ...	282	12	159	12
Oakabella ...	278	12	...	...
Narra Tarra ...	...	...	...	...
Tibradden ...	344	8	...	...
Myaree	315	13	...	...
Sand Springs ...	347	12	...	...
Mullewa... ...	338	9	55	9
Kockatea ...	287	9	52	6
Bootenal ...	491	10	...	...
Geraldton ...	412	13	139	10
Greenough ...	361	10	108	6
Bokara	440	13	152	12
Dongara ...	361	8	137	9
Dongara (Pearse)	349	10	136	9
Strawberry ...	356	13	116	9
Nangetty ...	233	12	...	...
Mingenew ...	276	13	116	14
Urella	250	6	...	...
Yandenooka ...	333	11	159	9
Rothesay ...	263	5	...	...
Field's Find ...	232	9	...	...
Carnamah ...	232	12	96	10
Watheroo ...	400	14	110	11
Dandaragan ...	352	15	222	15
Moora	511	14	153	11
Yatheroo ...	593	10	305	14
Walebing ...	573	13	183	15
New Norcia ...	433	12	320	14

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	636	13	592	12
Belvoir	608	11	605	14
Mundaring ...	733	15	629	16
Wandu	696	17	561	18
Guildford ...	609	12	360	15
Kalbyamba ...	...	...	426	17
Canning W't'r'w'ks	744	13	512	12
Perth Gardens ...	608	14	584	15
Perth Observatory	603	17	534	18
Subiaco	545	15	450	17
Fremantle ...	525	16	412	20
Rottnest... ...	660	19	...	...
Armadale ...	596	11	422	...
Rockingham ...	799	18	681	19
Jarrahdale ...	1,164	15	1,295	20
Mandurah ...	845	16	576	17
Pinjarra	769	16	709	19
Yarloop	718	17	641	19
Harvey	690	17	548	19
Upper Murray ...	872	17	695	20
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	438	11	...	...
Dowerin ...	453	10	...	...
Momberkine ...	249	6	...	...
Monglin ...	444	10	...	...
Newcastle ...	375	11	380	10
Eumalga ...	404	12	391	10
Northam ...	408	12	214	12
Grass Valley ...	383	9	190	8
Meckering ...	403	11	...	...
Cunderdin ...	416	8	87	7
Codg-Codgin ...	367	9	127	13
Yarragin ...	204	5	75	8
Doongin... ...	356	8	110	7
Cuttenning ...	445	10	139	12
Whitehaven ...	548	12	...	...
Sunset Hills ...	403	12	200	11
Cobham	407	17	311	17

RAINFALL—*continued.*

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
South-West, Central—*contd.*				
Yenelin	412	10	196	10
Mt. Caroline ...	358	9	...	...
York	387	19	268	17
Dalbridge ...	384	11	328	15
Beverley ...	360	13	272	11
Bally Bally ...	441	15	240	15
Barrington ...	313	12	330	13
Stock Hill ...	423	10	209	6
Sunning Hill ...	465	12	...	...
Brookton ...	410	13	251	9
Wandering ...	416	13	427	11
Glen Ern ...	444	12	328	11
Pingelly ...	407	10	287	8
Marradong ...	544	13	439	12
Bannister ...	566	13	481	13
Wonnaminta ...	...	...	315	6
Narrogin ...	402	20	282	19
Narrogin State Farm	431	16	334	18
Wickepin ...	434	12	...	...
Gillimanning ...	309	11	253	13
Bunking ...	351	10	221	10
Bullock Hills ...	300	13	...	...
South-West Division (Southern Part):				
Bunbury ...	611	14	405	21
Collie	495	17	488	18
Glen Mervyn ...	389	15	462	13
Donnybrook ...	445	15	481	19
Boyanup ...	517	18	...	...
Ferndale ...	403	17	...	...
Busselton ...	408	19	366	20
Quindalup ...	588	18	434	22
Cape Naturaliste	378	19	428	19
Lower Blackwood	345	11	...	...
Karridale ...	599	21	502	25
Cape Leeuwin ...	590	22	559	25
Biddellia ...	667	15	...	...
The Warren ...	737	18	834	21
Lake Muir ...	382	19	...	...
The Peninsula ...	382	26	...	...
South-West—*continued.*				
Mordalup ...	314	18	...	...
Deeside	431	17	541	20
Riverside ...	392	16	...	...
Balbarup ...	452	13	505	14
Wilgarup ...	460	18	469	22
Bridgetown ...	464	18	352	16
Westbourne ...	360	23	...	...
Hillton	495	...	300	6
Greenbushes ...	306	12	302	16
Greenfields ...	357	21	...	...
Glenorchy ...	435	11	360	12
Williams ...	361	12	281	11
Arthur	340	12	242	8
Darkan	436	11	...	...
Wagin	330	17	231	12
Glencove ...	260	15	174	15
Dyliabing ...	301	14	154	14
Katanning ...	283	13	247	17
Kojonup ...	478	17	310	18
Broomehill ...	289	17	276	14
Sunnyside ...	335	20	206	15
Woodyarrup ...	303	14	192	14
Mianellup ...	290	16	132	9
Cranbrook ...	314	13	...	...
Toolbrunup ...	330	14	146	15
Tambellup ...	302	14	147	16
Blackwattle ...	253	9	...	...
Woogenellup ...	282	15	197	18
Mt. Barker ...	459	17	280	19
Kendenup ...	389	15	249	15
St. Werburgh's...	433	21	285	19
Forest Hill ...	535	18	365	18
Denmark ...	927	19	...	...
Grasmere ...	797	21	395	19
Albany	822	21	384	20
King River ...	683	16	345	13
Point King ...	797	19	413	18
Breaksea ...	625	23	248	17
Wattle Hill ...	...	...	...	...
Cape Riche ...	408	13	...	...
Cherillup ...	264	15	167	12
Pallinup ...	260	12	166	11
Bremer Bay ...	493	18	133	13
Peppermint Grove	578	20	...	...
Jarramongup ...	286	10	...	...

RAINFALL—*continued.*

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
Eastern Division:				
Dural	398	9	10	3
Wiluna	358	12	22	4
Gum Creek ...	360	6	Nil	...
Mt. Sir Samuel ...	342	8	178	4
Lawlers	316	9	9	1
Leinster G.M. ...	384	9	24	4
Darda	265	11	5	1
Lake Darlôt ...	...	...	...	...
Mt. Leonora ...	151	6	34	3
Mt. Malcolm ...	101	6	52	3
Mt. Morgans ...	171	8	75	2
Burtville ...	183	5	...	...
Laverton ...	192	8	18	1
Murrin Murrin...	113	5	18	2
Yundamindera ...	86	5	13	3
Tampa	59	1	39	2
Kookynie ...	71	5	88	2
Niagara	108	6	35	2
Yerilla	75	3	133	3
Edjudina ...	79	3	60	4
Menzies	215	6	52	4
Mulline	227	7	7	3
Waverley ...	174	5	22	2
Goongarrie ...	192	7	37	6
Mulwarrie ...	257	6	...	...
Bardoc	190	4	20	2
Broad Arrow ...	218	5	121	4
Kurnalpi ...	92	5	81	5
Bulong	165	5	102	4
Kanowna ...	190	8	66	4
Kalgoorlie ...	208	6	25	5
Coolgardie ...	190	8	24	5
Burbanks ...	226	6	13	3
Woolubar ...	200	4	...	...
Widgiemooltha...	199	6	39	5
50-Mile Tank ...	201	7	66	4
Waterdale ...	148	8	...	...
Norseman ...	205	7	98	8
Lake View ...	243	10	...	...
Bulla Bulling ...	260	8	20	5
Boondi	209	12	39	7
Boorabbin ...	208	9	42	7
Eastern—*contd.*				
Koorarawalyee ...	204	6	103	3
Karalee	229	7	22	2
Yellowdine ...	201	7	..	...
Southern Cross...	262	8	59	10
Parker's Range...	255	13	...	...
Parker's Road ...	...	...	...	...
Mt. Jackson ...	154	6	...	...
Bodallin ...	313	18	163	7
Burracoppin ...	369	7	94	4
Kellerberrin ...	352	10	154	9
Merredin ...	331	5	79	6
Nangeenan ...	337	8	100	5
Mangowine ...	429	12	...	...
Wattoning ...	252	7	...	...
Noonjarin ...	287	7	...	...
Eucla Division:				
Ravensthorpe ...	196	17	123	12
Coconarup ...	150	14	...	...
Hopetoun ...	314	13	210	10
Fanny's Cove ...	637	13	...	...
Park Farm ...	547	18	...	...
Esperance ...	660	17	342	14
Gibson's Soak ...	364	16	...	...
30-Mile Condenser	296	15	...	...
Swan Lagoon ...	278	12	...	...
Grass Patch ...	200	11	...	...
Myrup	496	17	...	...
Lynburn ...	374	12	...	...
Boyatup... ...	443	13	...	...
Middle Island ...	593	16	...	...
Point Malcolm ...	262	18	...	...
Israelite Bay ...	150	12	197	14
Balbinia... ...	...	...	...	...
Frazer Range ...	180	5	...	...
Balladonia ...	109	7	97	8
Southern Hills ...	155	6	...	...
Eyre	112	9	100	14
Eucla	91	9	51	11

The Observatory, Perth,
7th September, 1904.

W. E. COOKE,
Government Astronomer.

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NOTES.

AGRICULTURAL LECTURES.—The examination held at the close of the recent agricultural lectures has resulted in the first prize being awarded to Mr. E. J. Gloster, and the second to Mr. C. E. Close.

POULTRY TICK REGULATIONS.—In this issue are published regulations controlling the spread of tick in poultry. All those interested should read them, and assist in carrying them out. All information or reports should be sent in to the Chief Inspector of Stock, Department of Agriculture, Perth.

DISEASES OF THE MAMMARY GLAND.—We have just received a copy of "The Diseases of the Mammary Gland of the Domestic Animal," by P. Leblanc, and translated by Lieut.-Colonel J. A. Nunn, C.I.E., D.S.O. The work is most up to date, and contains some valuable information. It has been placed on the shelves of the Library of the Department, and may be examined by the public.

PEKIN DUCKS.—Of late the Indian Runner duck has come very much into favour as an egg-producer, they often being called the Leghorn duck. While we admit that they are good layers, yet it is generally admitted that Pekins, when bred for the purpose, will lay equally as well, besides having the additional advantage of

being the best of all for table purposes. A correspondent states that he is getting an average of $25\frac{1}{2}$ eggs from each of his Pekin ducks per month. This is certainly a good average.

BEE SWARMING.—A writer in one of the Bee Journals says he has for years used lemons to attract swarms. He says: "I can attract a swarm in a few minutes, and get them where I wish, be it in a log, a hive, a box, or even in my hat. To do this I simply rub some bits of lemon or lemon-leaves on the place I wish them to swarm on. There is no doubt that bees like the odour of lemons, and I have never known it to fail." Will some of our bee-keepers try this and send in their experience to the Department?

PASPALUM VIRGATUM.—From experiments made with this grass in the South-Western districts, it is considered advisable to warn settlers and others against its indiscriminate planting, as on favourable ground such as exists in the South-Western districts, it grows so rank that it soon becomes a nuisance and little better than a weed. Neither horses nor cattle will touch it when any other food can be obtained. In the drier districts, however, it may be grown to advantage, as it will supply food when other grasses cease to grow, and by stock eating it off it is prevented from spreading.

HOW PLANTS BREATHE.—Besides giving out oxygen in assimilation, trees also take in oxygen from the air through their leaves, and through the minute openings in the bark called lenticels, such as the oblong raised spots or marks on the young branches of the birch and cherry and many other trees, says a student of tree life. All plants, like animals, breathe, and plants, like animals, breathe in oxygen and breathe out carbonic acid gas. This process of respiration, or the breathing of the tree, goes on both day and night, but it is far less active than assimilation, which takes place only in the light. Consequently more carbonic acid gas is taken into the tree than is given out, and the surplus carbon remains to be used in growing.

IMPORTATION OF SUFFOLKS.—During the recent visit of Mr. Crawford, the Acting Director of Agriculture, to the Eastern States, he attended one of Mr. A. A. Dangar's sale of Suffolk Punches, and was successful in purchasing eight mares for the Government of this State. Seven of the mares are in foal to one or other of the following celebrated stallions: War Dance, Strongbow, and Defiance. One of the mares is dam to three colts that sold for an average of 129gs. each, while another is dam to a colt that sold for 163gs. The mares and the stallion will be kept at the Chapman

Experimental Farm for stud purposes. After a year or so it is intended to hold an annual sale of stud stock, in order to allow farmers and others the opportunity of purchasing animals to improve their own stock.

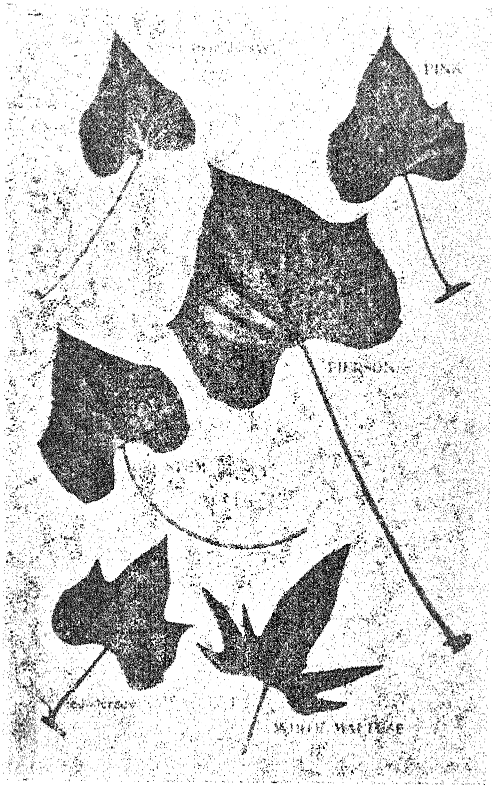
EARTH NUTS.—Those who have an acre of ground to spare should try the cultivation of earth nuts. They are popularly known amongst children as pea-nuts, or monkey-nuts. They are easily cultivated, and produce big returns, while almost any quantity can be easily disposed of in Perth at from 4d. to 6d. per lb. The bulk of our present supply comes from China. There is no sweeter edible nut. They also form excellent fattening diet for poultry, rivalling oil-cake in this particular. They require but little cultivation, once the seed is above ground and beginning to flower. Each plant bears as many as forty nuts. Planting six inches apart, in rows eighteen inches apart, will suffice. The bud forms and dips into the ground where the nuts form. The present is the proper time to plant. Last year a South Perth resident produced a prolific crop of these nuts, which were as highly appreciated by the children as by the poultry.

IMPORTED PIGS.—A consignment of six pigs, four Berkshires and two Large Blacks, were landed at Fremantle recently. These pigs have been purchased by the Department of Agriculture. Two of the Berkshires are direct from the experimental farm, Queensland, and are the progeny of imported stock from England. Another of the Berkshires is from the Hawkesbury Agricultural College, N.S.W., and is by the imported sire Burton Tosti out of Shaftesbury Belle. With regard to this pig Mr. Potts, the Director of the College, stated that it was the best pig bred last summer, and was specially selected for the New Zealand Government, but owing to the new regulations restricting the introduction of pigs into that colony, the order was cancelled and the pig sold to this Government. Mr. Potts further adds that we have been fortunate in securing such a really first-class animal. The fourth Berkshire was obtained from the Roseworthy College, South Australia; other pigs from the same stock have turned out well and obtained prizes wherever exhibited. The two Large Black Essex were obtained from Mr. Porter's stud, South Australia. Altogether they are a valuable lot of pigs, and should be the means of greatly improving the present stock in this State. It is possible that they will be sold before the publication of this issue of the *Journal*.

THE RABBIT PEST.—The marked increase of the rabbit pest in the Eastern States has been seriously exercising stockowners. An ex-Minister of Lands in Queensland, Mr. Leahy, who has lately been touring in the west of that State, states that where rabbits were twelve months ago rarely seen, they now abound, their burrows

even being thrown up along the main roads. He advises the remedy of paying a scalping rate. The good season now prevailing in South Australia is creating proportionate anxiety on account of the increase of the pest in that State. At Bombala, in New South Wales, the Pastures and Protection Boards have concluded that as methods hitherto employed for their repression have been fruitless, that poisoning by phosphorised pollard or water is a danger to bird life, and may bring a scourge in the shape of insects, some other plan should be adopted. They urge that disease should be introduced which should not be communicable to man or other animals, and that the Government should request the Pasteur Institute of Paris to send out a skilled bacteriologist to experiment. The Bombala Pastures and Protection Board propose that all P. and P. Boards set aside 5 per cent. of one year's income, to be supplemented by an equal contribution from the Government, to defray the cost of these experiments, which are to be under Government supervision. In Victoria complaints are being made about the increase of the starlings, which, it is feared, will prove as great a pest as the sparrows; probably more so, as they are more timid.—*Exchange*.

TROPICAL AGRICULTURE.—In a recent issue of the *Western Mail* an article appeared on tropical agriculture. The writer, in a most able and concise manner, pointed out the many advantages to be derived from the cultivation of tropical and sub-tropical produce in our Northern Territory. He says:—"When one reflects upon the millions of acres of land in the North-West and North now lying idle and unproductive, it seems pitiable that no effort has been made to turn even a portion of that country to some account. We are more behindhand in tropical cultivation in this State than in any other, and north of Geraldton, for the hundreds of miles of coastline stretching round to the Northern Territory, there is complete absence of tropical culture. There are many directions in which this condition of affairs could be remedied, and the example of those more enterprising settlers in corresponding latitudes in Queensland followed with advantage. The cocoanut, the banana, and the mango could just as easily be produced on the rich northern soils of this State as in the State of Queensland, where bananas and mangoes are grown to perfection. Particularly as regards bananas, it is astonishing that we should be prepared to go on paying the exorbitant price ruling in Perth for the imported fruit when we could so easily and cheaply produce it ourselves. The price paid here for a dozen bananas would purchase almost a bunch in another State. One reason for the high price obtaining here is, of course, the damage sustained in the long journey. Bananas and mangoes require rich soils, and there is any amount of this and to spare. Cotton and rice, on the other hand, require intense cultivation, and the employment of a large quantity of labour. But there is no demonstrated reason why the northern soils should not grow both these and the india-rubber tree to perfection."



Sweet Potatoes.—Typical leaf of each variety reported upon.

THE SWEET POTATO.

(*Ipomoea batatus*), Syn. (*Batatus edulis*).

GEO. L. SUTTON, Experimentalist, H. A. College, N.S.W.

(*Continued.*)

Six varieties of sweet potatoes were under trial. The names of the varieties were: White Maltese (H. A. C. White), Pink, Jersey Red, Big-stem Jersey Yellow, Short-stem Jersey Yellow, and Pierson. The four latter are varieties new to New South Wales, and formed part of the consignment of six imported into this State from the United States of America, in 1902, by the Hon. Minister for Agriculture. Two of the varieties—Bush Vineland and White Maryland—proved bad keepers and unsuitable for storing through the winter. The roots of these latter varieties, which had been stored last autumn, were found to be quite rotten when required for bedding in the spring. The trial was so arranged that each of the other varieties could be compared with the one known as White Maltese, which up to the present has been used for our main crop, and has always given very satisfactory returns.

The soil of the plots selected for the trial was almost pure sand and as even as could be obtained. It was very poor, but otherwise very suitable for this crop. The previous crop had been cow-peas, which were eaten off by sheep. The cow-peas had received a light dressing of stable manure.

In order to raise plants for this trial, roots of those varieties which had remained sound whilst stored during the winter were bedded in a cold frame during the last week in July. Plants from these were available by the time the frosts were over, but in order not to incur the risk of loss by a very late frost, they were not set out until 8th October, 1903.

The ground had been previously prepared, and had had two ploughings—a deep one in the winter and a shallow one, about 4 inches deep, just in time to allow the ground to be prepared for setting out the plants. The plants were set out with a spade 2 feet apart in drills, which were 3 feet apart. Just before planting the following mixture—

Superphosphate, 4 parts
Sulphate of potash, 1 part

at the rate of $3\frac{1}{2}$cwt. per acre, was distributed in the row by means of the fertiliser attachment to the maize drill.

Owing to the peculiarity of this season—low sun heat—the plants did not make their usual early rapid and vigorous growth, and in consequence the crop was very late in maturing. It was not deemed advisable to commence digging any of the roots until 18th April, 1904. Only half the area in the trial was then harvested. The other portion was allowed to remain so as to throw some light upon the amount of increase likely to result "when the crop was allowed to remain after the roots were mature," and "during the entire growing season."

The centre portion—two chains long—of each drill was dug and weighed. From this result the rate per acre was calculated. In the following table the results are shown:—

SWEET POTATO TRIAL.

Results of the Early Harvesting.

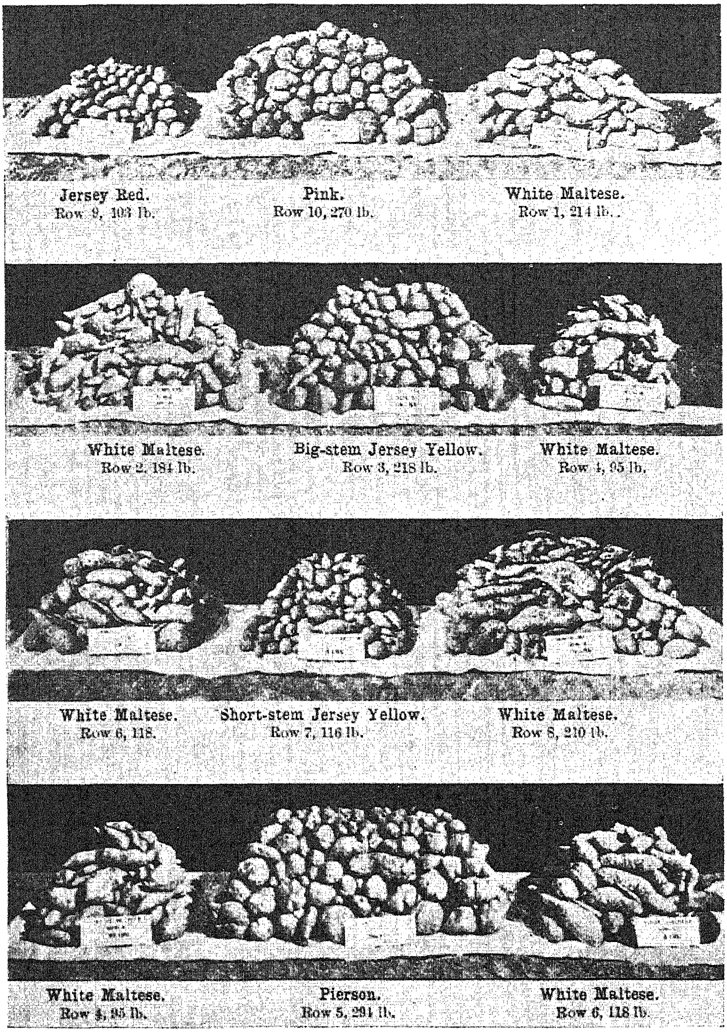
Plants set out 8th October, 1903. Roots harvested 4th April, 1904.

Plot No.	Drill No.	Variety.	Weight per portion of drill weighed.	Computed yield per acre.	Remarks.
			cwt. qr. lb.	t. cwt. qr. lb.	
F. II.	2	White Maltese	0 3 8	4 10 1 12	
	3	Big-stem Jersey Yellow ...	1 3 22	10 14 0 12	
	4	White Maltese	0 3 11	4 13 1 6	Three misses.
	5	Pierson ...	2 2 14	14 8 3 0	
	6	White Maltese	1 0 6	5 15 3 16	Three misses.
	7	Short-stem Jersey Yellow	1 0 4	5 13 3 20	
	8	White Maltese	1 3 23	10 15 0 10	
	9	Jersey Red ...	0 3 22	5 4 0 12	
	10	Pink	2 2 24	14 18 2 8	

From the above results, the varieties, arranged in order of merit, will be as follows:—

1. Pierson.
2. Big-stem Jersey Yellow.
3. Pink.
4. White Maltese.
5. Short-stem Jersey Yellow.
6. Jersey Red.

On 22nd June, 1904, it was considered that the potatoes had made their maximum development, as their growing season had



SWEET POTATOES.—Yields from equal areas—$\frac{1}{10}$ acre.

ended with the advent of frosty nights. At this date the harvesting of the experiment was completed, with the following results:—

Results of Late Harvesting.

Plants set out 4th October, 1903. Roots harvested 22nd June, 1904.

Plot No.	Drill No.	Variety.	Yield per portion of drill weighed.			Computed yield per acre.			
			cwt.	qr.	lb.	tons	cwt.	qr.	lb.
F. II. ...	12	White Maltese	2	1	12	12	19	1	4
F. III. ...	13	Big-stem Jersey Yellow	2	2	19	14	13	2	18
	14	White Maltese	2	2	6	14	0	3	16
	15	Pierson	1	3	14	10	6	1	0
	16	White Maltese	3	0	20	17	9	2	16
	17	Short-stem Jersey Yellow	2	1	3	12	10	1	22
	18	White Maltese	2	1	15	13	2	0	26
	19	Jersey Red	1	1	14	7	11	1	0
	20	Pink	5	0	15	28	4	2	26

From the results of this late harvesting the order of merit is somewhat changed, and is as follows:—

1. Pink.
2. Big-stem Jersey Yellow.
3. White Maltese.
4. Short-stem Jersey Yellow.
5. Pierson.
6. Jersey Red.

It will be seen from a comparison of the tables that the yield per acre of each variety was very much increased, in most cases it almost doubled itself, during the last two months of the growing season. This to some extent may be due to the peculiarity of this present season; but, in the absence of contradictory proof, it seems wise, if yield is an object, to allow most of the varieties to remain in the ground as long as possible even after they are mature, or fit for the table.

It is evident from a study of the results obtained that some of the new varieties are far more prolific than the old White Maltese. Growers, however, can only determine the most suitable varieties for their particular district and conditions by a trial, as the following reports will show. These reports are of trials made in 1902, when only a few plants of each variety were available for distribution. Messrs. Haywood Bros., Pambula, reported:—

"White Maltese (H.A.C. White) gave best results; one hill produced 15lb. of roots.

Pierson grew to a large size; one root weighed 9½lb. Not as prolific as White Maltese.

Pink and Jersey Red gave about equal results.

Big-stem Jersey Yellow. Only fair results.

Bush Vineland. Least of all."

We are satisfied that these varieties will thrive on the South Coast.

Mr. W. Farrer, "Lambrigg," Queanbeyan, reported:—

"The Jersey Red did best of all the varieties tried."

Mr. S. W. Carr, Principal of the Avondale School, reported:—

"None could beat the White Maltese either for yield or flavour."

In order to test the edible quality of all the varieties, and especially of the new ones, samples of each variety were submitted to several persons for trial when cooked. Nearly all reported that the new ones were superior in quality to either of the old ones, being more luscious and palatable. Mr. Adams, our Registrar, considered that the Jersey Red was the best table sweet potato, and the Pink the worst.

The trials completed unquestionably prove that the new varieties are a valuable addition to our list of food crops. Each of the varieties tried has some quality superior to the old ones.

The following brief description of some of the characteristics of the varieties will probably prove of interest.

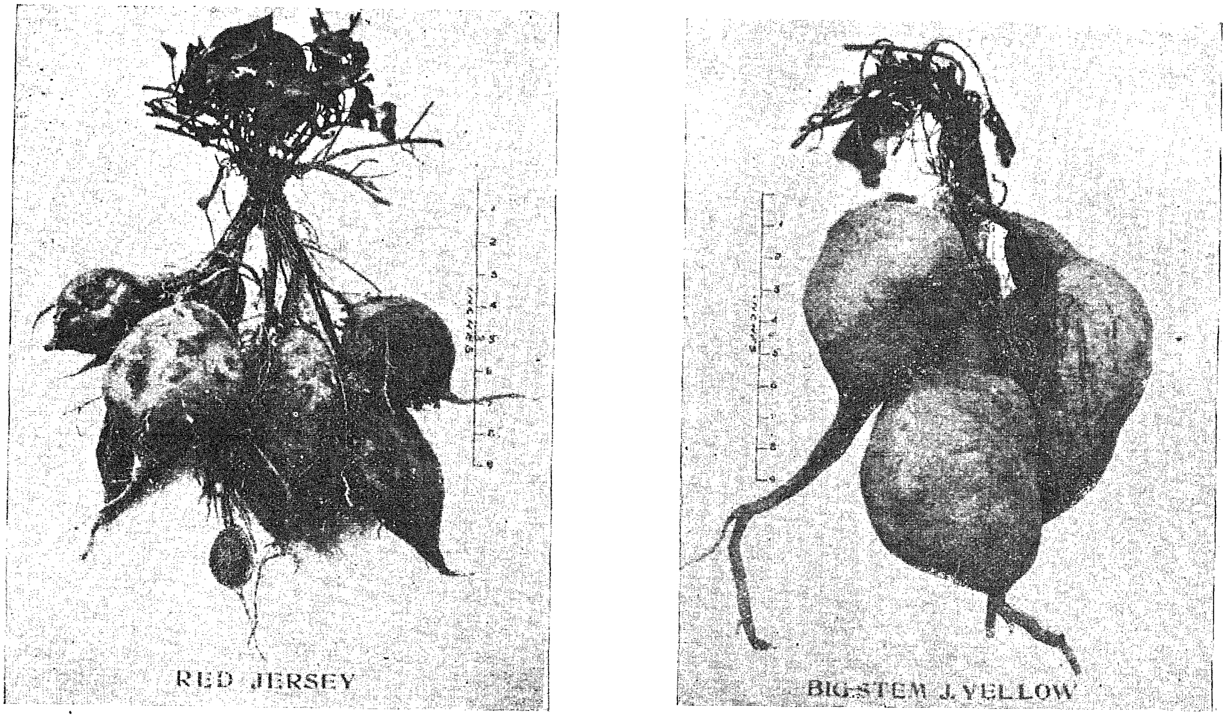
Big-stem Jersey Yellow.—A vigorous and very productive variety. The vines are abundant, with rather large leaves of the ivy shape. The roots are a good shape, yellow in colour. A rather late variety.

**Jersey Red.*—Rather a weak grower. The vines are not abundant; the leaves are small, and of the ivy type. The roots are small, but regular in shape, short and plump, and red in colour. The least prolific, but the most desirable as regards quality. An early variety.

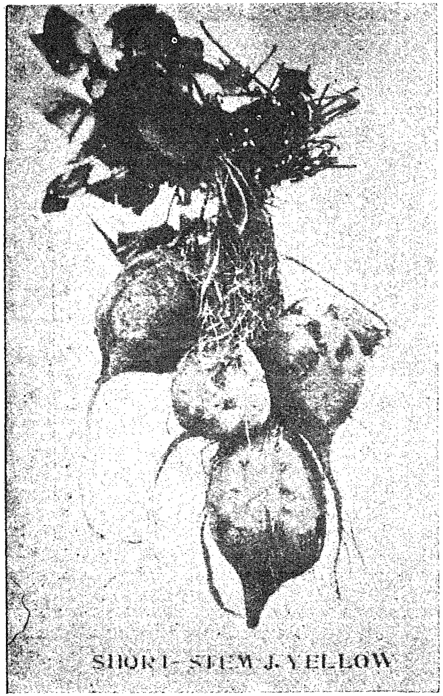
White Maltese.—This is an old reliable favourite. The vine is semi-bushy in character, with little tendency to root at the joints. The leaf is quite distinct in shape from any other variety—except Bush Vineland—that I have seen. The roots are white in colour, with a tendency to grow very long in loose soil. Many of the roots weigh 11lbs. each. The roots are of fair quality, somewhat dry. They keep remarkably well. A mid-season variety.

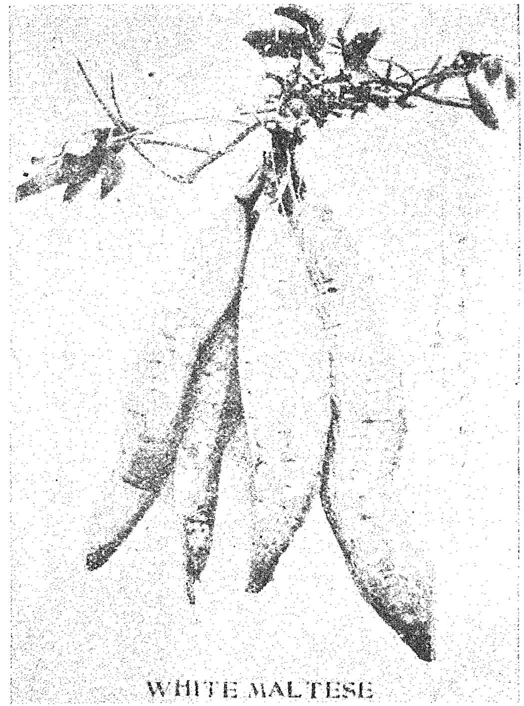
Pink.—A late variety. A good yielder, but rather coarse; more suitable for stock food than for the table. The growth of vine is not excessive, but the runners attain a great length and root at every joint. The leaf is small, of the usual type. The most prolific, but the worst for the table. A fair keeper.

* On the illustration the name appears as "Red Jersey." Jersey Red is the more commonly used name.



SWEET POTATOES.—Jersey Red and Big-stem Jersey Yellow.





SWEET POTATOES.—White Maltese and Short-stem J. Yellow.

Short-Stem Jersey Yellow.—A fair grower, with abundant vines of the usual type. Only a fair yielder. The roots are of good quality and shape. They are pale yellow in colour, and keep well. An early variety.

Pierson.—A vigorous grower. Produces plenty of vine, with large leaves of the ivy type. A good cropper. Roots of good shape, and of good quality for the table; the roots keep well; the colour of the roots is a deep cream. This variety is one of the best of the introduced ones. The roots cluster around the main stem, are attractive and chunky in appearance, and should sell well. An early variety.

WEEDS AND THEIR SUPPRESSION.

WHAT IS A WEED?

Any plant growing where it is not wanted is a weed. It matters not if the plant in question is in general a useful one; so long as it occupies ground which is intended for growing other crops, it must be classed as a weed. According to this definition it will be seen that wheat, rape, and potatoes are weeds if growing amongst other crops where they were not sown intentionally. This should not be forgotten, although the term weed is usually associated with plants such as thistles, couch, charlock, or docks, which are never intentionally cultivated.

DANGERS OF WEEDS.

The most serious objections to weeds may be stated in few words as follows:—

(1.) They absorb from the soil moisture and manures which would otherwise go to nourish and increase the crop which is being cultivated.

(2.) They "crowd" the crop, screening it from obtaining an adequate amount of light, which is necessary for healthy growth and for the proper assimilation of the soil and air constituents. The effect of this screening is to hamper the growth of the plants during early life, especially in the case of crops of slow growth.

(3.) Many weeds,—*e.g.*, bindweed and cleavers—pull down cereals, or assist in their downfall, rendering the work of cutting at harvest both difficult and expensive.

(4.) Weeds may harbour, or favour the development of, insect pests, as charlock does the turnip "fly," or they may temporarily harbour rusts and mildews, which spread to the cultivated crops later.

(5.) The pecuniary value of samples of cereals is reduced by the presence of cockle, garlic, cleavers, and vetches; and the market value of hay and other farm produce is similarly lowered by certain weeds or their seeds.

(6.) Some weeds taint the milk of cows which have fed upon them, whilst others,—*e.g.*, meadow saffron, and water hemlock—are poisonous to stock.

Most farmers recognise that it is impossible to obtain the best returns from the land when weeds are allowed to grow unchecked. Few, however, may be aware that in many cases the yield in crop on even a moderately weeded area may be from 40 to 50 per cent. higher than on a similar unweeded area.

MANNER OF DISTRIBUTION.

Before the suppression of weeds can be intelligently dealt with, it is essential to have a clear conception as to the manner in which weeds obtain access to the farm, and the methods by which they are spread broadcast amongst cultivated crops. The manner of distribution is very varied, amongst the commoner processes being:—

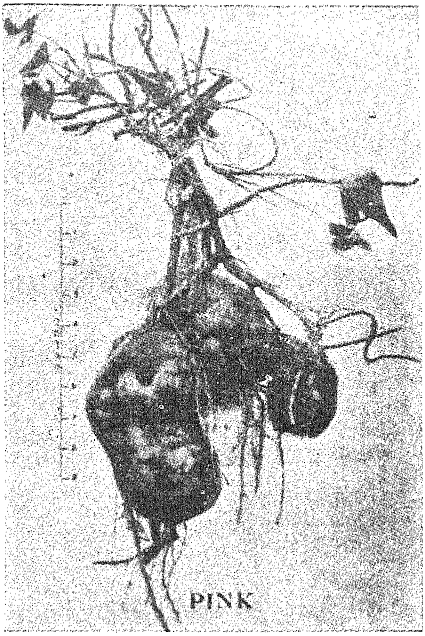
(*a.*) Distribution effected by means of the wind, many seeds, like those of the poppy, being so small that they are readily scattered considerable distances from the parent plant.

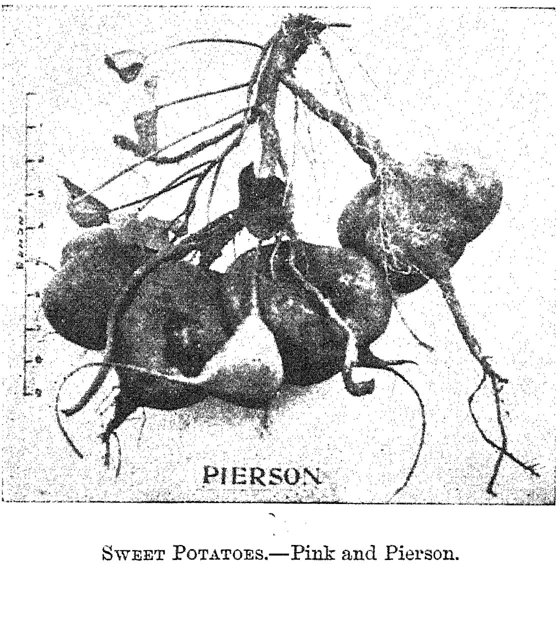
(*b.*) Special parachute-like apparatus, or other arrangement, of fluffy hairs and flattened wing-like projections, by which seeds, such as those of the thistle, dock, groundsel, etc., are rendered buoyant, and easily carried about in a light breeze.

(*c.*) Direct sowing over the land, or indirectly by being brought on to the farm in inferior hay, and so spread by means of farmyard manure.

(*d.*) Screenings from threshing-machines, sweepings from barns and hay-lofts, etc., often find their way to the manure heap, and as many seeds of weeds may be uninjured by the heat of fermentation, they will in due course pass to the fields. Some weeds may even germinate better after lying in the manure heap, or after passing through the stomach of an animal.

(*e.*) The use of impure seed is a potent means of introducing weeds to a farm. The presence of one per cent. of dock seed in a mixture of grass and clover seed means *ten or more dock plants per square yard* all over the field wherever such a sample is shown at the ordinary rate for leys.





SWEET POTATOES.—Pink and Pierson.

METHODS OF SUPPRESSION.

Having obtained some insight into the manner in which weeds are spread, it is possible to devise some general principles upon which their suppression should be based. But it must be emphasised that, whatever methods are proposed, they should be promptly, vigorously, and faithfully carried out: Systematic well-timed effort is the foundation of efficiency.

(1.) The most obvious mode of suppressing weeds is to prevent their seeding. When it is recognised that an ordinary charlock plant produces more than 1,000, and a moderate-sized poppy at least 10,000 to 15,000 seeds, the force of the adage that "one year's seeding is seven years' weeding" is obvious. Further, as many weeds produce seeds which do not germinate uniformly, the mischief is greater than at first sight appears, for they may lie dormant in the soil and come up subsequently at inconvenient times. The prevention of seeding should extend to weeds growing in hedgerows, and on roadsides and waste places, etc.

(2.) Under no circumstances should imperfectly-cleaned seed be either purchased or sown. At the same time care should be exercised as to the disposal of screenings, sweepings of haylofts, etc. Such refuse should be thoroughly scalded before giving to stock, or burnt.

(3.) Deep ploughing is sometimes resorted to with considerable success, many seeds rotting when deeply buried. Others, however, remain dormant under such conditions, without losing their vitality, and may subsequently be brought to the surface. Shallow cultivation and the preparation of a good tilth are more advisable, as by this means the seeds are encouraged to germinate, when they may be destroyed by further stirring of the soil. Such a method, taking care to keep the seeds near the surface, will clear the ground of many annual and biennial weeds, such as poppy, charlock, and some species of thistle.

(4.) The eradication of perennials, such as couch, bindweed, and creeping-thistle, needs careful and well-directed effort. These plants are propagated by underground runners bearing buds, and the best treatment where they are concerned is shallow ploughing and thorough cultivation, the weeds being collected and burnt. Or the weeds may be brought to the surface and left to the drying effects of wind and sun.

(5.) Hand-pulling and total removal of weeds is the most efficient means of destruction. Digging with fork or spade, or collection by means of the harrow after

being loosened with the plough may also be adopted, but these methods are all expensive, and only resorted to when other plans have failed or are inapplicable. In every case collected weeds should be burnt.

(6.) Judicious cutting with spade, hoe, or scythe will destroy all weeds, but ill-timed cutting may only encourage what it is desired to suppress. Many weeds when cut near the ground send up new stems, and these are produced at the expense of food stored below ground in the previous season. The growth of these secondary stems weakens the plant as a whole, and if, when produced, they are immediately cut off, and the process repeated, total destruction will be the result, no matter what the plant may be.

The first cutting should be early in the year, and as often after that, throughout the summer, as new shoots appear. If left too long they may either seed or again store up food in the roots in preparation for the next season's growth. One cutting in the case of perennials is quite valueless.

(7.) Rushes, sedges, and horsetails are indicative of a sour soil, and this can only be remedied by draining.

(8.) The application of manure and artificial fertilisers induces considerable changes in the character of the herbage on pastures, and of the weeds on arable land. For example, nitrogenous manures stimulate the growth of useful grasses, which tend to choke out buttercups, cowslips, and other weeds or less useful plants. The sour condition of the surface soil can be partially remedied by a dressing of lime, which is, more or less, a specific against sorrel, corn marigold, and some other weeds. The application of five to eight cwt. of basic slag per acre to pastures on stiff clay land often has a wonderful effect in encouraging clovers and generally improving the herbage.

(9.) Close feeding with sheep will often check certain plants as ragwort, and prevent them seeding.

(10.) Finally, spraying crops with chemical substances, more especially with sulphate of copper (bluestone) and sulphate of iron, has been found exceedingly useful in destroying weeds, especially charlock, in young corn crops.—*The Board of Agriculture and Fisheries' Leaflet, No. 112.*

THE MODERN SILO.

THE NECESSITY FOR SILAGE.

In response to many queries *re* silos and ensilage, the following article, written by T. Cherry, M.D., in the *Agricultural Journal*, of Victoria, is reproduced:—

Animals which chew the cud differ from all other classes in requiring their food comparatively juicy and bulky. Their digestive apparatus is formed to suit this kind of food. Hence the cow or bullock cannot thrive on exclusively dry food so well as the horse. In Victoria it is almost the invariable rule that green food completely disappears from December till the autumn rains, while in many districts it happens that there is little green grass for six or eight months in succession. In the northern areas there is often abundance of trefoil, grasses, and self-sown crops going to waste in October and November. In the south the maize crop cannot be eaten by the dairy herd so fast as it matures. Any method by which these green fodders can be preserved in the succulent condition is well worth the attention of the farmer. It will enable him to utilise his hay and straw to best advantage, and carry the stock through periods of drought with comparative ease. By a combination of dry and succulent food the largest amount of nutriment is extracted from both. In some districts green fodder and roots can be grown, and these may take the place of silage, but in all cases it is a great advantage to be able to secure the crop just when it is in the best condition, and there is no question that, except where irrigation is practicable, the silo will come to be regarded as indispensable on every progressive farm.

THE CAUSE OF FORMER FAILURES.

Up to the present, silage has not been a success in Australia. Many farmers have tried the stack and pit, but few have continued to use them. The reasons are, first, the degree of uncertainty as to how the silage will turn out, and second, the unsatisfactory feeding results often obtained.

The conditions necessary to ensure good silage were laid down by Gilbert and Lawes in 1886. They pointed out the necessity for excluding the air, and the consequent advantage of first chaffing the green stuff. Unfortunately, many men jumped to the conclusion that any kind of stack or heap would do if sufficiently weighted, and disappointing results have followed. When green stuff of any kind is put together in a heap, a rise of temperature ensues. This rise of temperature shows that combustion of some kind is going on, and unfortunately the material which first disappears from the silage by this combustion is the sugar, which forms one of the valuable food substances contained in the crop. Oxygen from the atmosphere is absolutely necessary to keep up the combustion, and hence the key to the production of first-class silage is the complete

exclusion of the air. To make any mass of green stuff fill all the interstices it requires to be chaffed—hence the stack is out of the question for permanent purposes. The more readily air can gain access, the greater will be the destruction of food materials. A deep silo is therefore better than a shallow one, and round is a better shape than rectangular. A round silo is not only stronger, but there are no corners to keep the mass from settling down uniformly. If these conditions are fulfilled there is no uncertainty with regard to the result.

ESSENTIALS FOR SUCCESS.

To obtain the best possible results we require (1) to cut the crop up small, so as to allow it to be pressed into a solid mass; (2) to have the silo air-tight; (3) to have it built so as to offer no obstruction to the uniform settling of the silage. Granted these conditions are fulfilled, it does not matter whether the silo is above or below ground. It is merely a question of convenience and economy. The framing must be rigid and strong to resist the great internal pressure, while the inside must be lined with some material impervious alike to air and moisture. It is practically impossible to build a square wooden frame sufficiently strong to resist the pressure without bulging in some part. Very frequently they crack at the corners. A wooden frame must be made on the same principle as a cask, the strength being secured by what corresponds to the hoops. If the silo is dug out below ground, it should be circular in shape, the walls perpendicular, and as smooth as possible. Projecting buttresses inside, and partitions of any kind are to be avoided. Brick and stone or concrete make first-class silos, but they must be properly lined, and they are much more expensive.

Probably the most satisfactory method is to build a wood silo on a brick foundation, the latter extending, say, five feet into the ground. The wood frame and hoops are to be erected in the way described below, and will remain as permanent parts of the structure. The inside lining and outside covering may be modified to suit the ideas and purse of the proprietor. These details will be discussed later on. The cheapest lining is $\frac{3}{8}$ wood, covered on the inside with acid-proof paper. Several brands of paper are on the market, and the thinnest will last two or three years. Next to paper comes plain sheet iron, either black or galvanised. This requires to be coated with ruberoid or suitable paint to resist the acid. The iron may be substituted for the paper lining after the latter has served one or two years, and the farmer is convinced of the value of the silo. For the first year or two no covering is needed beyond a coat of tar on the outside of the lining boards, but later on the outside may be covered with weatherboards or with sheet-iron.

In suitable localities, the cheapest of all is a good pit, the earth from the excavation being used to form a bank round the top, and thus increase the total depth. On many farms such a silo can be prepared in a week or two, the whole cost being simply the labour involved, and hardwood planks for lining the upper half.

LOCATION OF THE SILO.

The silo should be convenient to the cow shed and other buildings, and also to the horse works, so that the chaffcutter may be easily used. As the chaffed material must be filled in at the top, an elevator is usually necessary. Where the buildings are on the side of a hill, a space may be cut out, and the earth used to form a platform for the chaffcutter, and thus the length of the elevator is less. The port-holes should be arranged so that the silage may be emptied down a canvas shute into a truck running to the feeding shed. The arrangement shown in Fig. 1. is a pit silo, combined with a hay loft over the cow stalls. It is most convenient for chaffing the green maize when filling the silo, and for mixing the silage with oaten chaff when feeding to the cows. It is slightly modified from the one in use on Mr. Stockdale's farm, Warragul.

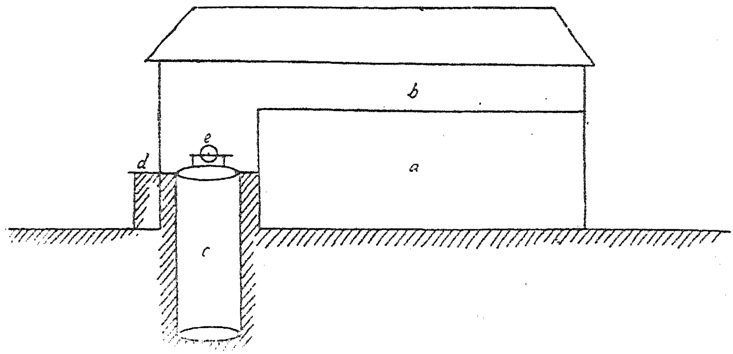


FIG. 1.—(*a*.) Cow shed; (*b*.) hay loft; (*c*.) silo; (*d*.) platform; (*e*.) chaffcutter.

One-half of the width of this end of the building is occupied by the silo, the other half serves for a place to mix the food. Another convenient method is to place the silo at an angle of the farm buildings, and run a light tramway to the different lines of feeding stalls.

DIRECTIONS FOR BUILDING A SILO.

DIAMETER, 13FT.; HEIGHT, 25FT.; CAPACITY, 55 TONS.
SEE FIGURES 2 AND 3.

The following materials will be required:—

16 pieces	...	2 feet	...	6 x 6	Redgum	Stumps
15 ,,	...	15 ,,	...	4 x 2	Hardwood	Studs
15 ,,	...	12 ,,	...	4 x 2	,,	,,
15 ,,	...	15 ,,	...	4 x $1\frac{1}{2}$	,,	,,
15 ,,	...	12 ,,	...	4 x $1\frac{1}{2}$	,,	,,
48 ,,	...	15 ,,	...	4 x $0\frac{1}{2}$	,,	Battens
8 ,,	...	5 ,,	...	9 x 3	,,	Plates
1,300 feet run.	...	9 x 6-out		Spruce Lining		
50 ,,	...	6 x $\frac{7}{8}$ T. & G., white				

1 roll P and B paper, or
56 sheets ... 6 x 3 x 26 gauge Plain Iron.

A suitable site having been selected, and levelled if necessary, place a stake in the centre of this space, and with a lath 7 feet long, describe a circle 13 feet in diameter. This circle then forms the outside of the line of the stumps. Fix the stumps at equal distances round this circle about 2 feet 5 inches from centre to centre. The tops should not project more than 6 inches above the level of the ground, and they require to be well rammed, as the stability of the silo against the wind is largely dependent upon the way it is fixed to the foundations. Mark on the top of the stumps a circle with a radius of 6 feet four inches, and fix the 9 x 3 plates in position, so that the outside of each plate at the middle of its length comes flush to this circle, and the ends project beyond it. The line by which to cut each plate, in order that they may form a regular octagon, may be found by laying on it the lath from the centre peg. The exact length of the outside edge of each plate will be found to be 4 feet $11\frac{3}{4}$ inches. The plates are then securely spiked or bolted to the stumps.

Next mark on the plates two circles, with a radius of 6 feet 4 inches and 6 feet two inches respectively. The inside one is the line of the inside of the silo. The 4 x 2 studs are then halved for 4 inches at one end, and their positions are marked on the outer circle 16 inches apart. There will be one space a couple of inches wider, which will serve for the port holes. Where necessary the plates are checked out to the 6 feet 4 inch line, so as to take the end of the studs, the inside edge of the studs thus standing true to the 6 feet 2 inch line all round the silo. In fixing the studs in position care must be taken to keep them plumb both ways, the 12 feet and 15 feet studs being placed alternately. When 8 or 10 of them have been braced in position, fix on temporarily two or three of the inside lining boards, and then nail on the battens to form the first hoop 18 inches from the plate. As it takes three battens to go round the whole silo, the ends should not be butt-jointed on the same stud, but should overlap by at least one stud. When the battens are fixed so as to complete the hoops to a height of 12 feet, the top studs 4 x $1\frac{1}{2}$, are nailed on to the sides of the 4 x 2's, about 2 feet being allowed for the lap. The outside hoops are made to "break joints" as much as possible, so as to add to the strength of the structure. The same applies to the $\frac{3}{8}$ inside lining; but in this case "butt joints" are made on each stud, so that the inside surface may be finished perfectly smooth. The paper may be tacked on in horizontal strips at the time of filling.

The port holes are made at intervals of 4 feet vertically, and should be about 18 inches square. The doors are made of a double thickness of 6 x 1 T. and G. Three 18-inch lengths are placed side by side, and three similar pieces nailed crosswise to them with a sheet of P. and B. paper between. The stops to receive the doors are made of 3 x 1, nailed to the sides of the two studs which form the jambs, so that the inside of the door is flush with the inside of the silo. The sill and lintel to complete the port-hole may be made of 3 x 2 hardwood. The doors are placed in position as

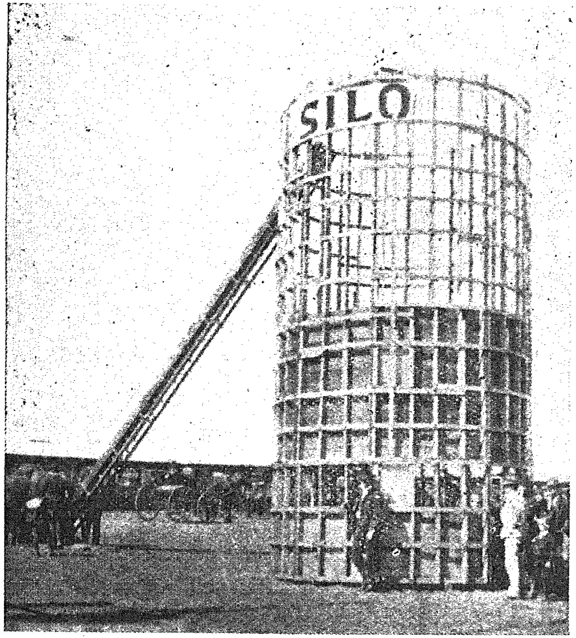


Fig. 2.—Silo in course of Construction.
Studs and Hoops in position, Lining half finished.

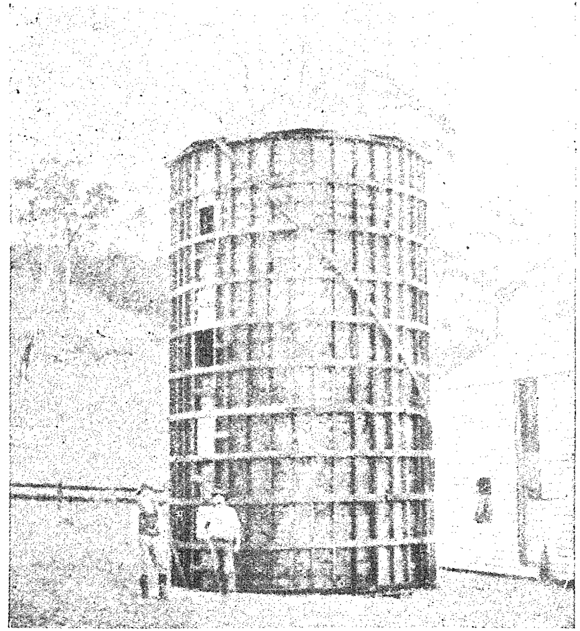


Fig. 3.—Silo complete.

the silo is filled. The weight of the silage keeps them secure, and they are knocked back into the silo as each becomes exposed by the silo being emptied from the top. Great care must be taken that the joints exclude all air and water, as the silage is often damaged at the port-holes. The doors should be covered on the inside with a sheet of P. and B. paper with a good lap, and the joints may be luted on the outside with clay if necessary.

The roof may be left until the silo is filled. In dry districts a thatch of straw will be sufficient, but the best method is to adopt the circular conical roof. Make a light frame from the tops of the studs to a centre post, and cover it with iron or ruberoid. A top plate marked and cut out exactly the same as the bed plate, but made of lighter material, is useful for keeping the studs upright during the erection of the frame.

Silos built in the way here described were erected last season by Messrs. Galbraith and Sons, Tyers, Traralgon, and by Mr. Chalmers, Leongatha. The total cost, including labour, was £17. Figs. 2 and 3 show this silo in course of erection and complete.

Larger and more expensive silos are shown in Figs. 4 and 5. The former was erected by Mr. W. J. Wilson, for Mr. J. H. Riley, Outtrim. It is 22 feet in diameter and 23 feet high. The superstructure is set on 5 feet of brickwork, cemented on the inside. The studs are 4 x 2, covered on the outside with white pine weatherboards rebated. Inside lining, one thickness $\frac{1}{2}$-inch spruce, one layer P. and B. paper, and finally plain galvanised iron. Arrangements are made for the drainage of the concrete floor. The cost was £50. Last summer it was two-thirds filled with the maize crop off five acres.

Fig. 5 is the silo built in 1902 by Mr. G. F. Syme, Dalry, Healesville. This silo is covered with galvanised iron on the outside, in place of weather boards. Mr. Syme supplies the following particulars:—

"The pit has been in every way a success, and the ensilage turned out in perfect condition, with the minimum amount of waste. The lower portion is of bricks laid in cement beneath the ground level, with a lining of cement, the portion above ground being built of timber studs of hardwood, 4 inches by 2 inches, and 14 feet long, lined inside with 6 x $\frac{1}{2}$ lining, then a lining of ruberoid 2-ply paper, and finally galvanised iron sheets, with a coat of ruberoid paint applied. The total depth of the silo from the eaves to the floor is 24 feet, 14 feet above ground, and 10 feet of brickwork below ground. The roof is sixteen-sided, with a ventilator on top. The interior diameter of the silo is 25 feet in the clear.

"On one side is the door through which ensilage is elevated from the chaffcutter to the top of the building; on the side towards the milking shed there are three doors for taking out the silage for feeding purposes. The silo will hold over 200 tons of made silage.

No weights were used, the top part when filled being thoroughly trampled and levelled, then watered to make a mould which seals the ensilage, making an air-tight covering. The outside of the silo is sheathed with plain galvanised iron. The plan of the silo is founded on an American model, but stronger in design, and heavier timber was used for the sills and studs than specified in the American plans."

Ruberoid paint protects the iron perfectly from the action of the acid. The silo should also be limewashed inside just before filling. Brick, concrete, and masonry are largely used in the United States for the silo, but as our object at present is to point out what can be done at the least expense, and yet give very satisfactory results as regards the silage, and at the same time serve for the framework of a permanent structure.

For a silo 25 feet high, if built from the ground level, the elevator from the chaffcutter requires to be 30 feet long. The easiest way to make the elevator is V shaped, as shown in Fig. 6 (*a*).

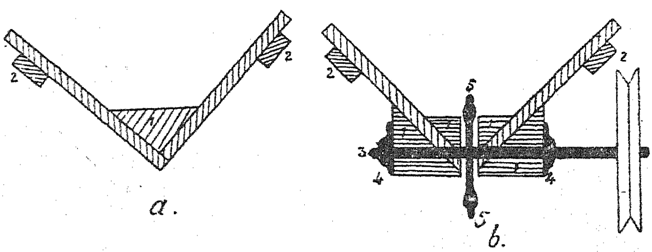


FIG. 6.—(*a*) Section of elevator; (*b*) top end of elevator; (1, 1) angle rails; (2, 2) battens; (3, 3) spindle; (4, 4) bearings; (5) sprocket wheel.

12 x 1 boards are nailed to the sides of an angle rail, the joints being broken, and battens nailed along the outside to stiffen the long length. A reaper and binder chain belt is arranged to run over a sprocket wheel at top and bottom, and the flaps are made of wood or sheet-iron and riveted on to the joints of the chain. By fixing a grooved pulley to the spindle of the top sprocket the elevator may be driven from a similar pulley on the chaffcutter by means of a rope belt. The sprockets run in slots sawn out of the angle rail, and the sides are strengthened by three feet of angle rail nailed on each side, as shown in Fig. 6 (*b*).

THE CIRCULAR PIT SILO.

The pit silo has not given universal satisfaction, chiefly for two reasons, the shape is usually square or rectangular, and often divided into a number of compartments; and, secondly, the silage is not generally chaffed. The disadvantages of both these features have already been pointed out. They all tend to promote fermentation by making it difficult to exclude the air. The pit should be

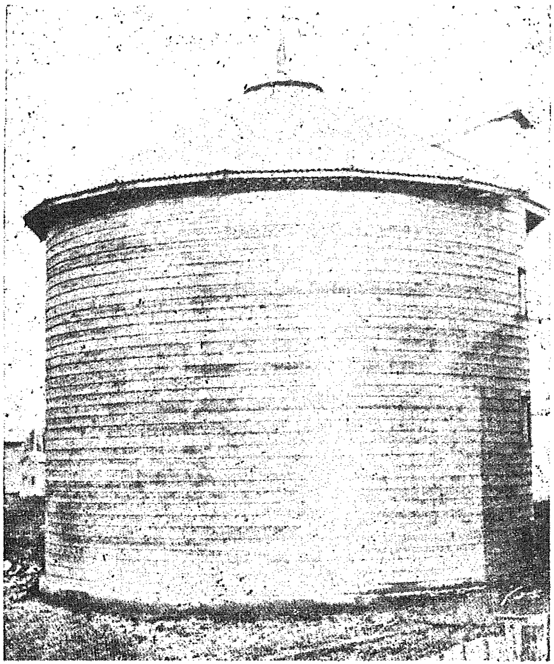


Fig. 4.—Silo in brick foundation, outside walls weatherboard.

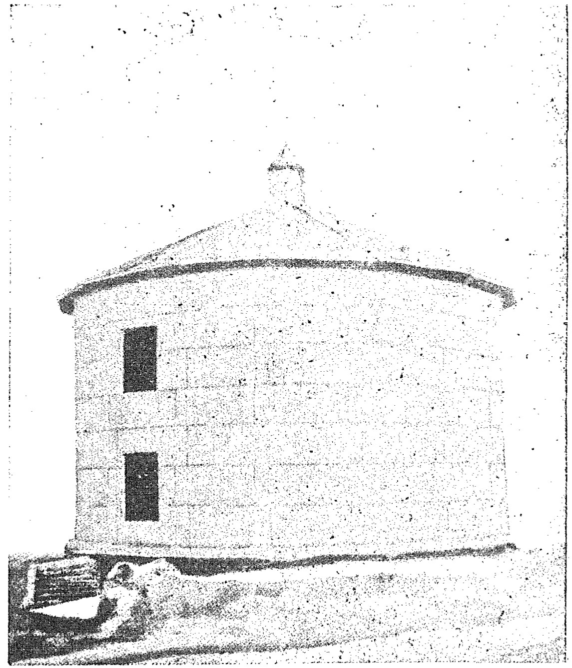


Fig. 5.—Silo in brick foundation, outside walls plain galvanized iron.

circular, excavated in the same way as a round tank, if possible with perpendicular sides, while the depth should be increased by using the earth to bank up the superstructure. The simplest method to do this is as follows;—Mark eight logs, each eight or 10 feet long, and about the dimensions of a railway sleeper, with a line forming part of the required circumference in the same way as the bed plate of the overground silo was set out as described above. Adze the sleepers to this curve, and set them true to the circle, as shown in Fig. 7. This circle is 2 or 4 inches larger than the pit to allow for the thickness of the vertical lining.

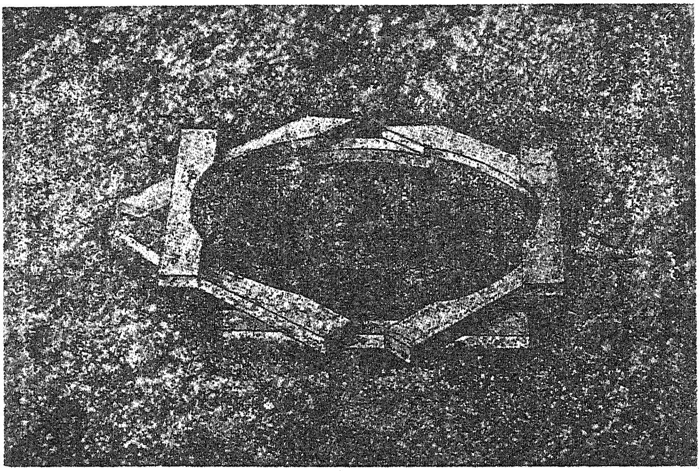


FIG. 7.—Sleepers adzed to circle in position at top of pit.

The earth is thrown out clear of the circle until the silo is excavated the necessary depth. The next step is to get the lining in position before ramming the earth round it. Red gum 6 x 1 or 9 x 2 makes the best lining, the latter being preferable. Spike 8 of the lining planks to the sleepers, equal distances apart, and brace them vertical. A light top plate is then adzed to the same circle as the sleepers. Suitable timber for this plate is 9 x 3. Nail the sections of this plate lightly to the eight vertical planks, and then begin to nail the lining in its permanent place. Keep the joints as close as possible, and when the first of the temporary planks is reached it may be necessary to take it off and replace it tight up to its neighbour. Continue in this way till all the planks are in position, and then ram up the earth from the outside. In this manner from 4 to 10 feet may be added to the depth of the pit. When finished all the joints are smoothed off with clay, and the earth walls of the pit may be treated in the same way if they are not smooth. In order to secure a perfectly smooth surface it is

worth while lining the whole pit with single-ply P. and B. paper. One or two doors may be made in the superstructure in the way already described. The total depth of the pit silo should be at least 18 feet. The advantages are ease and economy of construction, and of filling, the chaffcutter being placed over the top. The disadvantages are liability to damp and the labour involved in hoisting the silage out. The first can be met in most districts by placing the pit under a roof, say at one end of the cow stalls, and two or more doors in the superstructure reduce the labour considerably.

A section of a good pit silo is shown in Fig. 8. In filling a deep pit, caution is required in respect of the carbonic acid gas, and the green stuff should be allowed to fall into it from the cutter for a few minutes before anyone descends to tread down the silage. If the pit is less than 18 feet in depth means should be adopted for weighting the material when first put into the silo. A covering of bags, and two feet of earth or stones will serve this purpose.

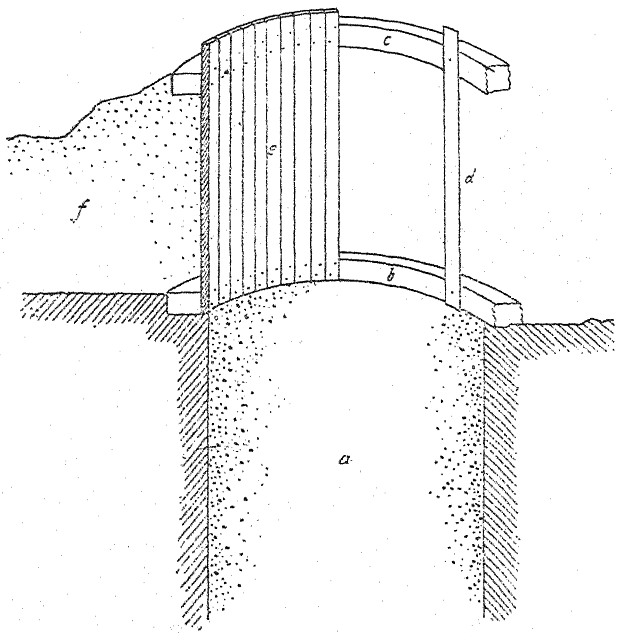


FIG. 8.—(*a*) Interior of pit; (*b*) bottom sleeper; (*c*) upper frame; (*d*) temporary plank; (*e*) permanent lining; (*f*) earth banked up.

THE STAVE SILO.

The stave silo is not so well adapted to Australian as to American conditions, on account of the way our hardwoods shrink

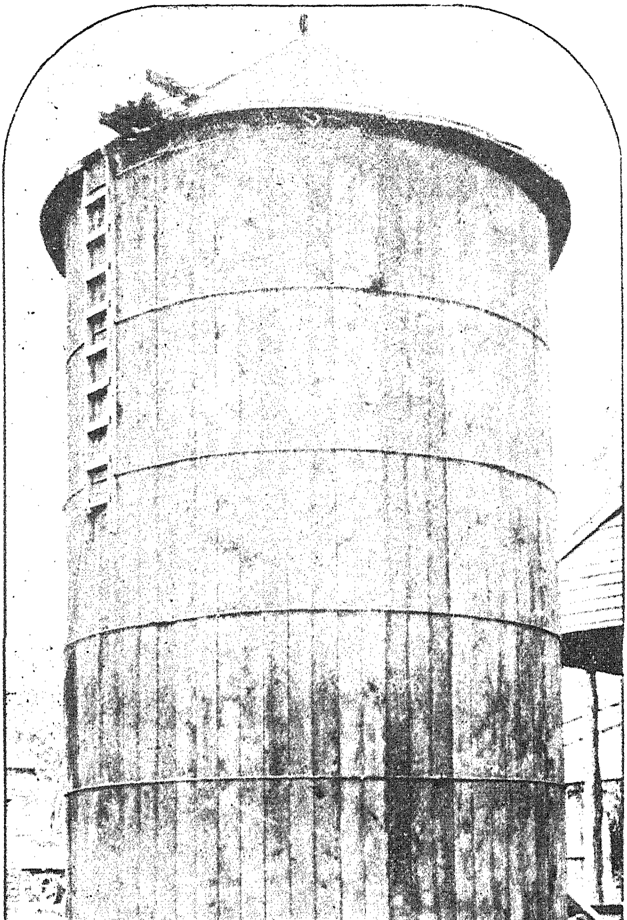


Fig. 9.—Stave Silo.

and warp as they dry. If built of Oregon or red deal the expense is much greater than a framed silo built in the way already described. The one shown in Fig. 9 was erected last year by Mr. Carpenter, Heywood. It gives first-class results as far as quality of the silage is concerned. The dimensions are 13 feet diameter, and 20 feet high. The cost was about £50.

Capacity of Silos.

The following table shows the calculated capacity in tons of round silos, adapted from King. In the larger sizes the actual capacity is probably considerably greater on account of less friction in the walls.

Depth, Feet.	Inside Diameter in Feet.				
	12	15	18	21	24
20	34	52	75	103	135
22	38	60	86	117	154
24	42	68	98	133	180
26	48	76	110	150	200
28	54	85	122	166	220
30	60	95	138	184	240
32	68	105	155	204	270

Filling the Silo.

Considerable difference of opinion exists as to the rate at which the silo should be filled. Some hold that it is best to fill it as rapidly as possible, so as to get the pressure on at once. Most farmers, however, find that perfectly satisfactory results are attained by filling at the rate of four or five feet a day. Very often the horses are employed cutting and carting the crop in the morning and in working the chaffcutter in the afternoon. The maize is usually cut ¾ inch long. As the silo is filled, it should be continuously tramped as thoroughly as possible, especially at the sides. There is some danger of the carbonic acid gas collecting after the first day or two if the silage is more than four feet below the first open port-hole. This danger is greatest in the pit silo, and the workmen should not go into them to resume trampling until the machinery has been running for some minutes. As the silage drops into the pit it will stir the air, and cause the carbonic acid gas to escape. The gas accumulates most during calm nights. No weights are required if the silage is more than 16 or 18 feet in depth. The loss in the upper part is greater than at the bottom, so that it is always an advantage to add the weight, if this can be easily done; but the layer of moulds which forms on the top excludes the air pretty effectively, and the owners of a good silo rarely think it worth the trouble of putting on the weights by means of stones or earth.

THE POSITION OF SILAGE AS A FOOD.

Comparative Analyses.

—	Water	Digestible Nutrients in 100lbs.		
		Proteine.	Carbo-Hydrates.	Fat.
Californian Analyses *				
Barley	74	1·8	12·7	0·9
Clover	72	2	13·6	1·0
Maize	75	1·3	13·5	0·6
Oat	72	1·5	14·8	0·9
Orchard grass	77	1·1	10·6	1·0
Average American Analyses †				
Maize	79	0·9	11·3	0·7
Sorghum	76	0·6	14.9	0·2
Lucerne	72	3·0	8·5	1·9
Grass	68	1·9	13·4	1·6
Maize and Sorghum	76	1·6	13	0·7
Victorian Analyses, 1903 ‡				
Maize, No. 1	75	1	14·6	0·8
Do. 2	80	0·9	10	0·9
Do. 3	81	0·9	9·6	0·8
Do. 4	80	1	10·5	0·8
Do. 5	82	0·7	5·3	0·4
Sorghum	78	1·2	11·3	1·3

* University of California, Bull. 132.
† Henry, p. 243.
‡ Chemical Lab. Dep. of Agriculture.—In calculating the digestible nutrients from the total amount of each constituent present, I have averaged the co-efficients of digestion. —T.C.

It will be seen that silage is rich in sugar, but poor in the flesh-forming constituents, with the exception of that made from the leguminous plants. Hence it cannot be expected to keep cows in first-rate milking condition unless supplemented with drier food containing a higher percentage of proteine. Oaten, lucerne, or clover hay is the readiest and most economical method for the farmer to supply this requirement, and silage mixes well with grain of all kinds, bran, oil-cake, and other concentrated foods. It must also be remembered that in the cold weather the cow requires something more than bulky succulent food. Just as in the summer the dry requires to be supplemented with juicy food, so in the winter the silage should be fed along with hay or similar material. The art of the farmer consists not only in supplying the proper amount of food, but in furnishing the animals with the food best adapted to their requirements.

From 30 to 40lbs. a day is about as much as the average cow can utilise to advantage. This amount furnishes about one-seventh of the proteine, and from one-third to one-half of the carbo-hydrates that the cows requires when in full milk. Sixty tons of silage will supply 30 cows for four months, provided it is supplemented as described above.

CROPS FOR THE SILO.

The best silage is made from plants with a solid stem, as maize, sorghum, and amber cane, while with these crops there is the further great advantage that the whole of the stem, if the material is chaffed, becomes so soft and succulent that none is wasted by the animals. Considering also the total yield per acre, there is no question that where a crop is specially grown for the silo one of these should be chosen. The hollow stem of the cereals contains air, and this increases the loss by fermentation, even when chaffed; but in spite of this defect there is no better way of utilising a crop of rye or barley grown for fodder, which has become over-ripe, to be relished by the cows. If other methods of securing green fodder are available, oats, wheat, and the mixed grasses and clovers are best made into hay. Cabbage, rape, and roots cannot be preserved as silage. In the North, the abundant trefoil, barley-grass, and self-sown cereals should be made into silage, because in most cases this is the best way to secure succulent food in the long, dry summer. Californian reports state that the trailing salt-bush, when chaffed, makes excellent silage. A mixture of peas, tares, beans, or clover, with maize or the cereals, greatly increases the food value of the silage, and according to Canadian experiments one acre of sunflowers, with two of tick beans and four of maize, makes a very satisfactory balanced ration for the dairy cow.

PERIOD OF MATURITY.

Silage should contain 75 to 80 per cent. of water; that is, most crops should be siloed when the flowers are all out and the grain well formed. An exception occurs in clover, trefoil, and lucerne, which should be cut when in full bloom, and allowed to wilt one day before filling into the silo. Generally speaking, the crop is ready for the silo a little earlier than it is for hay. Maturity is very important in the case of maize and similar crops, which mature rapidly after the cobs are well formed. Immature maize contains little nutriment, as will be seen from the following table* :—

COMPOSITION OF ONE ACRE OF MAIZE AT DIFFERENT PERIODS.

New York (Geneva) Station.

		Water. lbs.	Dry Matter. lbs.
July 30 ...	Tassels, out ...	16,426 ...	1,619
August 21 ...	Kernels, milky ...	27,957 ...	4,643
September 7 ...	„ glazed ...	25,093 ...	7,202
September 23 ...	Crop ripe ...	20,542 ...	7,918

STACK SILAGE.

In conclusion, a word may be said about stack ensilage. It will be seen from the foregoing that I do not recommend it for

* From Henry, *Feeds and Feeding*, p. 167.

general adoption, on account of the amount of waste due to the imperfect exclusion of the air. This is shown by the fact that stack silage has always lost the peculiar aroma of chaffed silage, indicating the extent to which fermentation has progressed. In a year like the present, however, when everywhere there is abundance of fodder to hand, it is very much better to make a stack of some kind rather than be without succulent food in the dry weather. The main points about the stack are that it should be circular and as high as possible. Settlement will reduce the height by about one-half. The stack requires to be weighted, and this is best done by placing a thickness of two or three feet of earth on top of it. A convenient plan is to surround it with a circle of saplings to keep the walls upright, and to locate it under a tree with a suitable branch 25 feet from the ground. A pulley can be attached to this, and used to hoist up the last of the fodder and the earth to be placed on top of it. If the binder has been used to cut the crop, the bands should be cut and the sheaves spread out as the stack is being built.

POULTRY NOTES.

By R. J. TERRY, Government Poultry Expert, Tasmania.

Among a certain class of farmers the idea seems prevalent that chickens are chickens, no matter whether they are pure-breds or scrubs. They are unable to see, or do not want to see, any real merit in well-bred poultry, and they ridicule the idea that there is any more practical value in a well-bred chicken than in their scrubs. Is there nothing in breeding? Can we expect to reap correspondingly good results from the haphazard breeding of the common fowls that we would obtain from the scientifically-mated thoroughbred? It is truly hard to understand why this class of our people still continue to breed scrubs, with all the evidence of poultrydom in favour of pure breeds.

It has often occurred to me that our poultry shows do not strike the practical chord with the vigour they ought to. We are in the habit of seeing birds at these shows that are as near perfection in shape and feather as the ingenuity and skill of man has been able to produce, and we are accustomed to hear the assertion over and over again in the show-rooms, as well as to see it regularly repeated in the columns of the press, that the thoroughbred—or, more correctly, standard-bred—fowl is the most profitable for the farmer and market poultry-man. I firmly believe this to be so; further, I know it to be true. When I say this I have no reference to the trade that comes to the fancier from the advertisement that

a win in the show-room brings to him, but simply to the ordinary market trade in dressed poultry and eggs.

But what are the average fanciers doing to convince the farmers, who form the great bulk of poultry-raisers in this State, that this is so? Simply nothing. We do see exhibitions of dressed poultry at shows occasionally, but the fancier does not compete in these classes. In reply, the farmer says the fancier is a crank, led away by enthusiasm for pretty feathers, and there the matter ends.

More attention must be given to dressed poultry and eggs in the show-room, if the fancier wishes to retain the confidence of the farmer. Fanciers should not only make an exhibit of their best birds alive, but also the dressed birds that are produced from such stock. To foster this feature substantial prizes should be given on the dressed birds, even if it means the reduction of the regular prizes.

The increased trade that would come to the fancier by thus giving prominence to dressed poultry and eggs in the show-room would be very large, I am convinced. Let me illustrate. An exhibitor, we will say, wins on Jubilee Orpingtons in the live department. A farmer comes along and admires the beautiful feathers on these specimens, but doubts their utility. The exhibitor takes him over to the dressed poultry exhibit, and points out the fowls prepared for market that came from his winning cock, or the eggs that his winning hen or pullet produced. Will it not be vastly easier to make a sale to that farmer than if no such object-lesson was at hand?

The gain in weight and cost of feed from birth to the fattening age of chickens at Bondville, Quebec, Canada:—

Period.	Number Chicks.	Live weight.	Meal.	Milk.	Blood Meal.	Millet seed.	Cost for week.		Av. cost per lb.
Week.		lbs.	lbs.	lbs.	lbs.	lbs.	\$	c.	cents.
At birth ...	183	15	...	...	...	...		...	...
1st	177	19	6	9	$0\frac{3}{4}$	1	0	36	9·0
2nd	...	33	18	29	3	5	0	51	3·7
3rd	...	59	34	50	5	...	0	65	2·5
4th	175	81	51	60	7	...	0	92	4·2
5th	...	116	80	90	5	...	1	26	3·6
6th	...	161	120	135	6	...	1	85	4·1
7th	173	216	158	208	10	...	2	55	4·6
8th	...	278	159	198	..	...	2	20	3·5
9th	...	348	152	190	...	...	2	11	3·0
10th	...	415	169	211	...	...	2	33	3·4
11th	167	486	187	235	...	...	2	59	3·6
12th	...	552	202	253	...	...	2	79	4·2
13th	...	625	229	278	...	...	3	15	4·3
14th	...	699	215	268	...	...	2	98	4·0
15th	...	774	234	292	...	...	3	24	4·3
16th	...	848	241	301	...	...	3	34	4·5

Average weight of all the chickens when 16 weeks old, 5lbs. 1oz. Average cost of feed for each pound gain in weight, 3·9 cents. (A cent represents a halfpenny.)

A number of the best cockerels were sold to the farmers and the fattening crates were filled with some chickens only twelve weeks old.

A lot of pure-bred and grade Barred Plymouth Rock chickens were fatted at the Smithville, Ontario, Station. These chickens were in a healthy but lean condition when placed in the fattening crates, and were fed out of a trough throughout the fattening period. The cramming machine was not used:—

Period.	Number chicks.	Live weight.	Gain in weight.	Meal.	Milk.
Weeks.		lbs.	lbs.	lbs.	lbs.
Com.	131	491½	...	...	...
1st...	...	654	162¼	252	438½
2nd	...	677½	23½	227	435¼
3rd	...	756¾	79¼	286	464
4th	...	827	70¼	286	534

"FORCED SWARMS."

A CANADIAN METHOD OF CONTROLLING SWARMING.

MORLEY PETTITT, in *Montreal Herald and Star.*

The keynote of modern business is specialisation and expansion. To beekeepers this means cutting out all side lines and keeping more bees. Not only that, but they must be kept with the least expense possible of time and money. To do this we must establish out apiaries and adopt methods quite different from those employed in a single yard.

The first problem in connection with out apiaries is that of controlling the desire, more or less developed in all bees, to swarm. Where one is devoting his whole time to a single yard, it is comparatively simple to allow this impulse to take its natural course; but while swarms are issuing and being hived at home, the thought would be unpleasant, to say the least, that swarms were issuing without being hived at several bee yards away from home.

A great many plans for the control or prevention of swarming have been proposed and adopted with varied success; but the one particularly under discussion is known as "forced," "brushed," or "shaken swarming." It was first brought before the public in a time and manner to attract public attention by L. Stachelhausen in 1900.

It is the purpose of this paper to describe briefly "forced swarming" as practised by myself, with a large measure of success, during the season of 1903. By it natural swarming is almost entirely avoided, and each yard visited only once every seven to ten days.

METHODS OF RETARDING SWARMING.

In the first place, every effort is made to retard swarming. Extracting supers are put on all except weak hives during fruit bloom, and a certain amount of evening up of brood—that is taking from a strong and giving to a weak—is done at that time. When white honey begins coming in freely, the brood is again evened up and in stronger hives alternated with empty combs. Comb honey supers are put on or extracting supers enough to contain the full amount of white honey expected per hive. Entrances are enlarged to their full extent, about 1¼ inches by 17 inches, and ventilation is given at the top of the supers, so that a current of fresh air will pass freely through the hive. Now, if the hives can be partly shaded and the brood chambers are large enough to give full scope to the laying powers of the queen, swarming will be greatly retarded. At the next visit all hives are examined for indications of the swarming impulse. If only empty queen cells are found and the brood-chamber is nearly full of brood a card of brood is removed and replaced by foundation; any cells containing eggs are broken down. The brood removed is used for strengthening weak colonies or forming nuclei.

METHOD OF SWARMING.

If any cell contains a queen larva it is proof the swarming impulse is far enough advanced to take action. Hives previously prepared for swarms have been distributed about the yard before starting operations. They each contain, in the order named, two dummies, three starters, one worker comb, three starters and three dummies, 12 in all, in a hive of 10-frame Langstroth capacity. One of these is brought and set down on bottomboard and stand behind the hive to be treated. The operator, who sits at the left of the hive, removes the three dummies from the right or farmer side of the new hive and shoves over the remaining contents so as to have the empty space next him. He now lifts the comb nearest him from the brood chamber, shakes it almost free of bees and places it in the new hive next the left wall. The next comb has a double space for shaking off bees in the old hive. It takes its place beside the first comb, and the return motion of the hands carries a dummy

from the new hive to the old. Comb No. 3 is shaken, carried to the new hive and dummy No. 2 is brought back. The fourth comb exchanges places with the first starter, and so on. When the twelfth comb has been shaken in its own hive and transferred to the new, the sixth starter put in its place and the old hive filled out with the three remaining dummies, we put on the supers, close the hive and the bees have been swarmed.

There is now a swarm hived on starters on the old stand under conditions fairly natural, at the convenience of the beekeeper, without fuss, excitement, or acrobatic feats. Leaving them in the old hive is merely a matter of convenience. Unless there is no honey in the supers it is not necessary to wait for the bees to fill themselves with honey before shaking, as they can do that at leisure afterward. These swarms behave in all respects like natural swarms just hived. If they swarm out next day, so would natural swarms under like conditions, and the same little devices must be used to make them contented. For example, in comb honey production it may be best to hive on a full set of starters (not omitting the comb) for a few days, then contract with dummies. Shade should be given, etc., and always ample ventilation. The empty comb in the middle is useful for various things. If the supers contain sections it catches the pollen which might otherwise go up. If extracting combs, it keeps the bees from all going up into the supers and deserting the queen.

LOSS OF QUEEN.

In extracted honey production it may be best to shake on a set of full sheets of foundation. I propose to test this matter fully this season. A few minutes after shaking swarms sometimes show signs of "queenlessness." The queen has been accidentally left with the brood, or, in rare cases, has been lost. In this case we do not bother hunting the queen, because she will do no harm with the brood, and if lost she cannot be found. In fact, we hunt queens, except in rare cases, but once a year, viz., at the clipping season. Give this queenless swarm a young queen, a queen cell, or a card of open brood and eggs. If the latter is given all but the best queen cell must be destroyed at next visit.

The "parent stock," as we call the hive of brood, sits directly behind the swarm and has enough bees to care for the brood and the best queen cells which have been saved unshaken. It is given an extracting super at once and removed to a new stand at the next weekly visit. To save time these parent stocks might be given laying queens, or, on the other hand, the brood might be shaken clean of bees and used for building up weak colonies.

For comb honey production I know of only one better system than the one just described, that is, to allow the bees to swarm naturally. No stocks work in sections with the same vigour as natural swarms. This system is the nearest approach to natural swarming and is, all considered, enough cheaper to make it more

profitable. In producing extracted honey I think that the 12-frame Langstroth brood chamber and super capacity of 24 frames, with one large entrance and upward ventilation from June 1st on, will reduce swarming to a minimum which may be almost disregarded.

On examining later stocks which have been shaken on starters without any comb, I found in some cases the queen gone. She had been worried to death by the bees, who could not see why she did not go up into the super with the rest of them.

The Mechanical Analyses of Soils and the Composition of the Fractions resulting therefrom.

INTRODUCTION.

The following interesting article, written by Alfred Daniel Hall, M.A., is taken from the "Transactions of the Chemical Society, Eng.":—

The mechanical analysis of soils, by which is meant the sorting out of the particles of the soil into groups, each of which contains material lying between specified limits of size, has long occupied the attention of agricultural chemists, although in this country, as compared with Germany or the United States, it has been but little practised. The importance of this determination lies in the fact that the behaviour of the soil towards water, its power of retaining and handing over the rainfall to the plant, and also its physical texture and amenability to cultivation—factors which are of greater importance in the nutrition of the crop than the amount of plant food present—are determined by the sizes of the particles of which the soil is composed. Without referring in detail to the voluminous literature which has grown up round the subject, it will be sufficient here to quote one or two of the more important papers illustrating the principles on which the process is based. The various methods in use may be divided into two groups; in one, the separation is effected by a stream of running water, the velocity of which is increased to carry over successively coarser particles, in the other by leaving the turbid mixture of soil and water to settle for given periods of time, the longer the time intervals the finer being the group of particles remaining suspended. The former method was made quantitative by Schöne (*Über Schlämmanalyse*, Berlin, 1867), and as modified by A. Meyer (Wollny's *Forsch. der Agricultur. physik.*, 1882, 5, 228) is in general use in Germany (Wahnschaffe, *Anleitung zu Wissenschaftlichen Bodenuntersuchung*, Berlin, 1903). The apparatus has been still further improved and the whole method reduced to an accurate form by Hilgard (*Amer. J. Sci.*,

1873, 6, 288; U.S.A. Division of Chemistry, 1893, *Bulletin* 38, p. 60), to whom we are indebted for a considerable elucidation of the whole subject. The second method, depending on sedimentation for a given time, was elaborated by Wolff (*Untersuchung. landw. Stoffe*, Berlin, 1875) and critically discussed by Osborne (*Conn. Agric, Exp. Station Report*, 1886, p. 141; 1887, p. 144) who showed that it would yield the same result as the running water method of Hilgard. With sundry modifications in detail, Osborne's method is now employed by the United States Division of Soils in the extensive soil survey which that Department is executing (U.S.A. Dept. of Agriculture, Division of Soils, 1896, *Bulletin* 4). In all the foregoing methods the soil is freed from its coarser particles by a system of sieves, and then the loose aggregates of the finer particles are, as far as possible, broken up either by long-continued boiling with water or by rubbing the paste of soil and water with a soft pestle formed from an india-rubber bung.

A fundamental modification of the whole process was introduced by Schlœsing (*Compt, rend.*, 1874, 78, p. 1276), who began by a preliminary treatment of the soil with dilute acid, then removed the salts and excess of acid by washing, and finally added a little ammonia to the liquid in which the soil was afterwards suspended. Schlœsing himself employed a simple sedimentation process which divided the residue into two fractions only, but it is clear that any method of fractionating the soil residue may be used, the essential difference being that in one case the soil is first washed with acid, whereas in the other the process is carried out on the raw soil. Schlœsing's method has not been widely adopted outside of France; Petermann, however, followed it in his examination of Belgian soils (*Recherches de Chemie*, Brussels, 1898), and it is also employed officially in Italy (*Staz. Sperimentale Agrarie Italiane*, 1891, 17, 672).

The object of the preliminary treatment with acid is twofold. In the first place calcium carbonate is removed, secondly the "humates" which are present in surface soils are decomposed, and the liberated humic acid becomes soluble in the ammoniacal liquid in which the sedimentation is afterwards conducted. In soils containing any large proportion of organic matter, such as the pastures and many of the arable soils of this country, the amount of the humates is sufficient to bind together a considerable quantity of the finest particles into loose aggregates which resist disintegration by the boiling or pestling preliminary to working on the raw soil. In other soils, calcium carbonate serves the same purpose of a temporary cement for the finest particles, even the weathering and management of the soil has the same effect of causing the material of a clayey nature to flocculate into loose aggregates, which behave as larger agglomerations. Again the power possessed by soluble salts of inducing flocculation of the clay particles is well known (compare Joly, Mécanisme intime de la Sedimentation, *VIII. Congress Géologique International*, 1900); hence Schlœsing's method presents an advantage in that it removes all soluble salts and conducts the

sedimentation in a practically uniform medium containing free ammonia in order to induce a maximum of deflocculation. How potent the presence of salts may be in causing flocculation may be seen from the following experiments, in which two pure clays were separated into fractions by sedimentation in pure water and in solutions containing 0·04 per cent. of sodium chloride and calcium sulphate respectively:—

250 c.c. water with	10 grams china clay.			10 grams modelling clay.		
	0.	Salt (0·1 gram).	Gypsum (0·1 gram).	0.	Salt (0·1 gram).	Gypsum (0·1 gram).
Falling in 1 minute ...	2·22	2·54	2·28	0·53	0·45	0·41
Suspended for 1, but falling in 25 minutes	3·91	6·04	7·30	1·45	8·76	8·30
Suspended for 25 minutes, but falling in 24 hours	2·08	1·50	0·37	2·33	0·9	1·38
Suspended for 24 hours ...	2·00	—	—	5·53	—	—
Total	10·21	10·08	9·95	9·84	10·11	10·09

Speaking generally, it is found that the preliminary treatment with acid gives a greater proportion of the finest order of particles (clay) than is obtained by working on the raw soil. Yet the acid employed is too weak to dissolve any appreciable amount of mineral material other than calcium carbonate, and the attack must be mainly directed towards those very fine particles which are so small as to approach the condition of dissolved matter. As then the acid treatment cannot create clay particles, its action would seem to consist in completing the work of resolving the temporary aggregates which is largely but not wholly brought about by the boiling or pestling processes in the other method; it, therefore, must give a more accurate measure of the proportion of these finest particles present in the original soil. For these reasons it seemed desirable to submit the two processes to a critical comparison, for Osborne (*loc. cit.*), who tried both Schlœsing's method and his own on the same soils, did not attempt to divide the soil after washing with acid into the same series of fractions as he obtained from the raw soil, but followed Schlœsing's division into a clay fraction and a single sand fraction, with the result that the two sets of results are not comparable. In order to secure a critical examination of the methods it was necessary to work on soils which are identical as regards their original physical structure, but which by processes of cultivation have assumed very different textures, so that in some there may be little and in others much of the finest material bound into the temporary aggregates which it is the function of the acid to resolve. For this purpose the Rothamsted soils provide examples of exceptional value; the management of each of the Rothamsted plots has been unchanged for 50 or even 60 years, some of them have been receiving organic manures annually during the whole period, others

have been entirely unmanured or have been receiving only mineral salts, and are, therefore, much depleted of their original store of organic matter. As a natural consequence, the physical texture, as shown by the tilth, by their tendency to dry into a stony or a friable condition, by the ease with which they can be cultivated, and by their water-retaining power, varies considerably in passing from plot to plot, yet it cannot be considered that the fundamental physical constitution of the soils has been sensibly altered, so small a fraction of the whole weight even of the surface soil is the sum of all the manures added during the experimental period.

It is assumed that the preferable method of mechanical analysis is that showing the essential identity of soils from neighbouring plots which may have acquired very dissimilar textures through differences of cultivation, since information is thus obtained as to the permanent rather than the temporary characteristics of the soil. It has been argued that the problem is not to ascertain the fundamental constitution but the current condition of the soil; that if, as is assumed, the working nature of the soil depends on the size of the particles, it matters little whether they are solid as with a sandy soil, or aggregates of smaller particles behaving like larger units as with a clay soil in a good state of tilth; but in the one case, unskilful management will ruin the tilth, which in the other is practically independent of the treatment, and although the two soils may for the time be similar, the analysis should aim at gauging their capacity and behaviour under all conditions by determining their real nature. If once the mechanical analysis provides an accurate description of the mineral framework of the soil, a consideration of other factors, such as the proportion of humus and calcium carbonate, may enable the analyst to form an idea of their actual texture; but no method of mechanical analysis can actually measure the texture, a problem which, if it is soluble at all in the laboratory, must be attacked by other processes.

THE SOILS EXAMINED.

The soils selected for analysis have been derived from the Rothamsted experimental fields; these fields are scattered about the estate and differ somewhat in texture, so that the results for a given field are only comparable among themselves. The soil is a strong flinty loam derived from the "clay with flints" which covers much of the chalk plateau in Hertfordshire; the subsoil is distinctly irregular, a neighbouring exposure showing, besides the true "clay with flints," pockets of almost unaltered "plastic clay" and of "tertiary" sand. The fields, with the exception of Barn Field, are nearly level, and there is evidence that the experimental portions were sensibly uniform at the start.

The *Broadbalk Field* has grown wheat every year since 1844. Of the soil samples examined Nos. 1, 2, 3, 4, were drawn in 1893, and Nos. 25, 26, 27, in 1904.

No. 1.—Plot 2, received 14 tons of farmyard manure every year (50 years).

No. 2.—Plot 3, unmanured every year (50 years).

No. 3.—Plot 6, received 3½cwt. of superphosphate 200lbs. of potassium sulphate, 100lbs. each of sodium and magnesium sulphates, 100lbs. each of ammonium sulphate and chloride every year since 1852 (42 years).

No. 4.—Plot 9, received a similar manuring to Plot 6, except that the ammonium salts were replaced by an average of 500lbs. of sodium nitrate added annually over the 42 years.

No. 25.—Plot 3, unmanured (61 years).

No. 26.—Plot 6, manured as described above (53 years).

No. 27.—Plot 9, manured as described above (53 years).

The *Hoos Field* has grown barley every year since 1852. The samples for analysis were drawn in 1903.

No. 5.—Plot 1o, unmanured every year (52 years).

No. 6.—Plct 2A, received 3½cwt. of superphosphate, 100lbs. each of ammonium sulphate and chloride every year.

No. 7.—Plot 2AA, received 3½cwt. of superphosphate and 275lbs. of sodium nitrate.

Hoos Potato Land is a part of the same field which grew potatoes for 26 years (1876—1901) after which it has grown barley without further manuring. Samples were drawn in 1903.

No. 8.—Plot 1, unmanured continuously.

No. 9.—Plot 3, received 14 tons per acre of farmyard manure every year (26 years).

No. 10.—Plot 5, received 200lbs. each of ammonium sulphate and chloride.

No. 11.—Plot 6, received 550lbs. of sodium nitrate.

The Park is grass land mown for hay each year, and has received the same manures since 1856 (48 years.) The samples were drawn in 1904.

No. 12.—Plot 3, unmanured continuously.

No. 13.—Plot 9, received 3½cwt. of superphosphate, 500lbs. of potassium sulphate, 100lbs. each of sodium and magnesium sulphates, 200lbs. each of ammonium sulphate and chloride.

No. 14.—Plot 14, received the same treatment as Plot 9, except that the ammonium salts were replaced by 550lbs. of sodium nitrate.

The *Barnfield* has been under cultivation for roots since 1843, and for the last 28 years has grown mangels, the manurial treatment has been practically continuous for each plot since 1856 (48 years.) Soil samples were drawn in 1903.

No. 15.—Plot 1o, received 14 tons per acre of farmyard manure every year.

No. 16. Plot 4o, received 3½cwt. of superphosphate, 500lbs. of potassium sulphate, 200lbs. of sodium chloride, 200lbs. of magnesium sulphate.

No. 17.—Plot 1c, received 14 tons of farmyard manure, and 2,000lbs. of rape cake every year.

No. 18.—Plot 4c, received the same treatment as 4o, with the addition of 2,000lbs. of rape cake annually.

No. 19.—Plot 4A, received a similar treatment to 4c, except that the rape cake was replaced by 200lbs. each of ammonium sulphate and chloride.

No. 20.—Plot 4N, received a similar treatment to 4A and 4c, except that the nitrogenous manure was 550lbs. of sodium nitrate instead of the ammonium salts or rape cake.

No. 21.—Plot 5A, receive 3½cwt. of superphosphate, and 200lbs. each of ammonium sulphate and chloride.

No. 22.—Plot 5N, received a similar treatment to 5A, except that the ammonium salts were replaced by 550lbs. of sodium nitrate.

The *Barnfield Grassland* was originally part of the preceding field, but was laid down to grass in 1874; no record has been kept of its occasional manurings.

No. 23.—Sample drawn from the portion next to Plot 1o.

No. 24.—Sample drawn from the portion next to Plot 1c.

All the samples are taken to a depth of nine inches unless otherwise stated.

In all cases the soil sample is dried at a temperature not exceeding 40°, roughly powdered, and passed through a sieve with round holes 3mm. in diameter, and all the analyses were made on the air-dried fine earth passing this sieve.

METHOD OF ANALYSIS.

Ten grams of the fine earth are treated with 100 c.c. of *N*/5 hydrochloric acid, the acid being renewed if it is not sufficient to dissolve all the calcium carbonate present. The soil is rubbed up for some time, without the application of pressure, with a soft pestle made of an india-rubber bung at the end of a glass rod; this pestling may be conveniently effected by the aid of a small water turbine. The undissolved material is then thoroughly washed until free from acid, and may be collected on a filter, dried, and weighed to ascertain the loss on solution, or washed immediately into the sedimenting vessel. In either case, after being freed from acid, it is thoroughly pestled again with water to which a few c.c. of strong ammonia have been added. A lipped beaker (about 10 cm. high and 7 cm. in diameter) is employed with marks at 8·5 and 7·5 cm. from the bottom; into this the mixture of soil and water is washed through two sieves, the first having round holes 1 mm. in diameter, the second being a woven wire sieve No. 100 brass wire cloth, 100 meshes to the inch. The material arrested by the sieves is dried, weighed, ignited, and reweighed. The beaker is filled to the mark with water, and left undisturbed for 24 hours. The turbid liquid is then decanted from the sediment, which is rubbed up afresh with a few c.c. of ammonia; water is added to the mark, and the 24

hours' sedimentation is repeated. The whole process is repeated day by day until the supernatant liquid is clear after 24 hours; that is, until all the particles which will not fall 8·5 cm. in 24 hours are removed. Generally about eight decantations are sufficient, but with some soils as many as fifteen may be required. The turbid liquid poured off is evaporated, and the residue dried in the steam oven, weighed, ignited over an argand burner, and weighed again, or the turbid liquor may be coagulated by acidifying and the residue collected by decantation. The sediment remaining in the beaker is worked up afresh in the same way, the water being only added to a depth of 7·5 cm., and left for two hours five minutes; the process is repeated as before, until all the material remaining suspended for that period is removed. The decanted liquid is again evaporated; the residue is dried in the steam oven, weighed, ignited, and reweighed. A third decantation follows with a water column 7·5 cm. in height, and the time of settlement 12·5 minutes; lastly comes a decantation for 75 seconds with a height of 7·5 cm. as before. Thus the whole of the fine earth is divided into seven fractions, the two coarsest by means of sieves, the five finest by settlement from water.

The times of settlement and the height of the water column are purely arbitrary, and may be varied at will in order to secure fractions of any desired diameter; the size obtained being determined by actual measurement under the microscope.

The whole process is a tedious one, requiring something like three weeks for its completion, and the evaporation of 20 litres or more of water. It can be shortened by the introduction of centrifugal methods whereby the force of gravity causing the fall of the particles is replaced by a much stronger centrifugal force (U.S.A. Department of Agriculture, *Year Book*, 1900, p. 399; Kilroe, *Proc. Roy, Dublin Soc.*, 1904, I. [v.], 223). Otherwise it admits of no acceleration; but with systematic working a number of determinations can be carried on simultaneously, and, except in the first and final stages, these demand but little time from day to day.

The following table gives the approximate size of the particles in each of the fractions obtained by the foregoing method. Examination under the microscope showed that whilst no fraction was absolutely free from smaller particles, the bulk fell within the specified limits.

TABLE I.

Sizes of particles in the groups separated by mechanical analysis.

	Diameter in mm.	
	Max.	Min.
1st Sieve	3·0	1·0
2nd „	1·0	0·2
1st Sediment	0·2	0·04
2nd „	0·04	0·01
3rd „	0·01	0·004
4th „	0·004	0·002
"Klay"	0·002	—

The groups of particles obtained in a mechanical analysis do not possess any definite chemical individuality; in the coarser grained fractions worn grains of quartz predominate, mixed with an increasing proportion of hydrated aluminium silicate and ferric oxide as the size of the particles becomes less, but even the finest fractions contain some free quartz. The following series of determinations show that whilst the coarsest fraction separated by sedimentation contains in the ignited state more than 90 per cent. of quartz and only 7·4 per cent. of aluminium silicate, the finest contains about 10 per cent. of quartz and 67 per cent. of aluminium silicate.

TABLE II.

Partial analyses of soil fractions separated by mechanical analysis involving a preliminary washing with acid.

Samples ignited to remove organic matter before analysis :—

Nature of Sample.	SiO_2.	Fe_2O_3.	Al_2O_3.
1st Sediment*	94·6	1·1	3·4
2nd "	92·0	1·2	6·2
3rd "	88·3	1·8	8·5
4th "	61·7	7·0	23·4
"Klay" No. 22	45·6	12·8	30·1
" " 21	45·4	12·2	30·3
" " 20	46·3	12·4	33·8
" " 19	47·3	12·7	31·6
" " 4	45·2	11·8	29·9
" " 3	44·7	12·4	30·3
" " 8	48·6	10·5	31·2
" " 10	44·5	12·5	29·9
Mean of "Klays"	45·9	12·2	30·9

* Mixed samples.

The presence of organic matter does not permit of an exact determination of the proportion of water of hydration, but by recalculating the analyses (which were all made on samples after ignition) on the assumption that the alumina is combined as $Al_2O_3,2SiO_2,2H_2O$, the approximate percentage composition of the finest fraction would be: kaolinite, 72—75; ferric oxide, 11—12; quartz, 9—10; alkalis and alkaline earths, etc., 4—6; nor is there much variation from this mean, at least in dealing with soils of similar origin, as with these from the Rothamsted fields.

It is probable that the physical properties of the soil are dependent on the size rather than on the chemical nature of the constituent particles, being determined in the main by the extent of the surface they expose. Deposits may be found consisting mainly of very finely divided quartz, which have all the properties usually associated with clay soils, the opposite case of coarse-grained kaolinitic material—chemically clay—but behaving more like sand, also occurs. Hence, a difficulty arises in giving the name of "clay" to the finest fraction obtained by mechanical analysis, and it has been suggested that this fraction should be distinguished by the designation "klay," this being defined as the material existing in the soil which possesses a diameter of less than 0·002 mm.

The theory of a particle falling through a viscous liquid has been considered by Stokes (Trans., *Camb. Phil. Soc.*, 1851, **9**, 8), who dealt with the motion of small water drops like fog through the air, and by Barus (*Amer. J. Sci.*, 1889, **37**, 122). From Stokes's paper is derived the following formula:—

$$v = \frac{2}{9}\frac{ga^2(\sigma - \rho)}{\eta},$$

for the velocity of the falling particle, where σ is the density of the particle, a its radius taken as a sphere, ρ the density, and η the coefficient of viscosity of the medium. Utilising this formula, the following diameters are obtained for the particles which just fall in the times specified for each group.

Sediment.	Limiting velocity of fall.	Diameter in mm. Calculated at 10°.	Diameter in mm. Calculated at 16°.	Diameter in mm. Minimum by observation.
1st	7·5 cm. in 75 seconds	0·040	0·037	0·04
2nd ...	7·5 " 750 "	0·0126	0·0116	0·01
3rd ...	7·5 " 7,500 "	0·0040	0·0037	0·004
4th ...	8·5 " 86,400 "	0·00126	0·00126	0·002

The agreement is as close as can be expected considering that the particles are not spherical, and that no precautions are taken to avoid convection currents due to change of temperature during the longer intervals of sedimentation. The use of a dilute solution of ammonia of uncertain strength instead of pure water might be thought to vitiate the value attached to η, the coefficient of viscosity, but a series of comparative measurements shows that various ammonia solutions, up to a much greater strength than is ever attained in carrying out the foregoing method, possess sensibly the same viscosity as pure water through a greater temperature range than that of an ordinary laboratory.

EXAMINATION OF SOILS RICH AND POOR IN HUMUS.

Analyses have been made by the foregoing method of eighteen of the Rothamsted soils, six being rich in humus through the accumulation of organic manures or after lying for some time in pasture, twelve being deficient because of continuous cropping either without manure or with mineral salts only. In order to obtain a critical opinion as to the effect of the preliminary washing in acid, the same eighteen soils have also been analysed without such treatment, that is, the raw soil has been rubbed up in distilled water only and separated by sieves and by sedimentation, using precisely the same times of settlement and distances of falling.

The results are set out in the following tables, of which Table III. gives the results when the material is weighed after drying at 100°, and Table IV. after ignition to remove organic matter.

TABLE III.—*Mechanical Analyses of Rothamsted Soils.*

Percentages after drying at 100°.

Number	1	2	4	25	26	27	8	9	16	15	23	18	17	24	19	21	20	22
	Broadbalk, 1893.			Broadbalk, 1904.			Hoss potato, 1903.		Barnfield mangel and grass soils, 1903.									
	Dung.	Unmanured.	Minerals and sodium nitrate.	Unmanured.	Minerals and ammonium salts.	Minerals and sodium nitrate.	Unmanured.	Dung.	Minerals only.	Dung.	Grass-land.	Minerals and rape-cake.	Dung and rape-cake.	Grass-land.	Minerals and ammonium salts.	Superphosphate and ammonium salts.	Minerals and sodium nitrate.	Superphosphate and sodium nitrate.
Separations conducted on raw soil with water only.																		
Fine gravel, 3—1 mm. ...	2·3	2·9	1·9	1·2	0·8	1·9	1·6	3·2	3·3	2·8	4·4	3·3	3·6	2·3	3·4	2·9	2·8	2·6
Grit, 1—0·2 mm. ...	6·8	7·2	7·3	5·2	5·4	6·7	5·8	5·2	5·9	7·8	7·1	5·5	5·9	5·5	5·6	6·2	7·0	7·0
1st sediment	23·9	22·7	20·6	21·2	22·4	19·5	18·7	20·2	19·5	17·9	20·6	19·4	20·2	16·9	23·4	21·6	22·6	23·0
2nd „	34·7	35·0	31·2	34·7	32·8	33·6	36·2	35·7	25·0	24·8	23·3	27·2	25·6	29·6	28·4	28·2	28·5	27·2
3rd „	11·2	9·0	9·6	9·6	9·9	9·3	11·4	10·2	9·7	9·5	12·9	7·5	8·7	12·9	8·7	8·7	9·2	8·1
4th „	8·3	6·2	7·3	6·7	6·1	6·6	6·2	7·5	8·0	9·1	9·6	5·5	7·7	11·2	5·7	9·6	5·7	6·0
Klay	12·7	14·5	18·0	17·5	18·2	16·6	17·2	16·9	22·9	25·2	17·4	27·6	24·0	13·1	21·6	19·1	18·3	18·6
Moisture	2·5	1·7	2·2	1·9	1·8	2·9	2·4	2·8	2·5	2·8	3·4	2·7	3·6	3·7	2·8	2·6	2·1	2·5
Total	102·4	99·2	98·1	98·0	97·4	97·1	99·5	101·7	96·8	99·9	98·7	98·8	99·3	95·2	99·6	98 9	96·2	95·0
Separations after washing with acid.																		
Fine gravel, 3—1 mm. ...	2·7	1·7	2·3	1·1	1·4	2·2	1·7	1·4	2·6	2·7	3·2	3·4	3·8	1·8	3·7	2·3	2·4	3·7
Grit, 1—0·2 min. ...	6·4	7·3	6·5	5·3	5·5	6·0	5·1	4·8	5·7	6·7	5·3	4·8	6·4	4·7	5·8	6·2	6·6	6·4
1st sediment	21·1	21·3	17·7	24·4	21·5	22·5	21·7	22·9	20·4	20·8	19·6	20·6	19·1	16·7	18·2	19·2	18·2	17·3
2nd „	33·3	33·6	32·5	31·6	32·5	31·6	29·6	29·8	24·7	22·3	26·2	25·9	24·8	28·1	28·8	29·7	29·8	31·1
3rd „	9·4	8·8	9·0	6·9	10·3	7·6	10·8	8·8	9·2	8·4	9·0	8·0	8·0	9·2	10·4	9·3	10·3	9·0
4th „	4·7	4·1	5·6	6·2	5·2	5·1	4·4	4·5	4·4	4 8	5·2	4·1	4·6	5·4	3·6	3·4	5·2	5·2
Klay	18·3	17·1	19·1	17·3	17·5	16·5	18·3	20·1	24·5	28·1	20·6	27·4	27·0	26·2	22·8	23·7	17·4	17·8
Loss on solution ...	4·0	4·3	4·8	3·6	3·8	4·4	3·6	4·4	4·5	4·4	4·7	2·8	3·2	3·0	4·1	3·4	4·5	4·3
Moisture	2·5	1·7	2·2	1·9	1·8	2·9	2·4	2·8	2·5	2·8	3·4	2·7	3·6	3·7	2·8	2·6	2·1	2·5
Total	102·4	99·9	99·7	98·3	99·5	98·8	97·6	99·5	98·5	101·0	97·2	99·7	100 5	98·8	100·2	99·8	96·5	97·3

TABLE IV.—*Mechanical Analyses of Rothamsted Soils.*

Percentages after ignition to remove organic matter.

Number	1	2	4	25	26	27	8	9	16	15	23	18	17	24	19	21	20	22
	Broadbalk, 1893.			Broadbalk, 1904.			Hoss potato, 1903.		Barnfield mangel and grass soils, 1903.									
	Dung.	Unmanured.	Minerals and sodium nitrate.	Unmanured.	Minerals and ammonium salts.	Minerals and sodium nitrate.	Unmanured.	Dung.	Minerals only.	Dung.	Grass-land.	Minerals and rape-cake.	Dung and rape-cake.	Grass-land.	Minerals and ammonium salts.	Superphosphate and ammonium salts.	Minerals and sodium nitrate.	Superphosphate and sodium nitrate.
Separations conducted on raw soil with water only.																		
Fine gravel, 3—1 mm. ...	2·0	2·6	1·8	0·8	0·7	1·8	1·5	2·5	3·1	2·6	4·2	3·1	3·3	2·0	3·2	2·8	2·6	2·4
Grit, 1—0·2 mm. ...	6·5	7·1	7·1	5·1	5·3	6·5	5·6	4·9	5·7	7·6	6·8	5·3	5·5	5·1	5·5	6·0	6·8	6·8
1st sediment	23·6	22·4	20·5	21·1	22·3	19·4	18·5	20·0	19·3	17·8	20·1	19·3	19·9	16·6	23·2	21·4	22·4	22·8
2nd "	32·8	34·2	30·9	34·4	32·5	33·2	35·9	34·6	24·5	24·2	22·0	26·9	24·9	28·2	27·9	27·9	28·3	26·9
3rd "	10·1	8·7	9·1	9·1	9·5	8·9	11·0	9·5	9·3	8·5	11·0	7·2	7·7	11·6	8·4	8·3	8·7	7·7
4th "	6·8	5·5	6·5	5·0	5·7	5·8	5·5	6·6	7·0	7·6	7·9	4·9	5·7	9·3	4·9	8·3	5·0	5·4
Klay	10·7	12·3	15·2	15·1	15·4	14·0	14·8	14·9	19·6	21·2	13·5	23·9	20·2	11·1	19·9	16·8	15·6	17·0
Loss on ignition ...	6·8	4·2	5·5	5·8	5·4	5·9	4·5	5·8	4·7	7·7	10·5	5·7	7·8	8·3	4·3	5·2	4·8	4·7
Moisture	2·5	1·7	2·2	1·9	1·8	2·9	2·4	2·8	2·5	2·8	3·4	2·7	3·6	3·7	2·8	2·6	2·1	2·5
Total	101·8	98·7	98·8	99·2	98·6	98·4	99·7	101·6	95·7	100·0	99·4	99·0	98·6	95·9	100·1	99·3	96·3	96·2
Separations after washing with acid.																		
Fine gravel, 3—1 mm. ...	2·5	1·6	2·2	1·0	1·3	2·0	1·6	1·3	2·4	2·5	2·9	3·2	3·5	1·7	3·5	2·2	2·2	3·5
Grit, 1—0·2 mm. ...	6·2	7·1	6·3	5·2	5·4	5·8	5·0	4·7	5·5	6·3	5·0	4·6	5·8	4·4	5·6	6·1	6·5	6·2
1st sediment	20·8	21·0	17·6	24·3	21·4	22·4	21·5	22·6	20·3	20·6	19·4	20·5	18·8	16·6	18·0	19·0	18·1	17·2
2nd "	32·2	33·3	32·2	31·4	32·3	31·4	29·3	29·3	24·4	22·0	25·3	25·7	24·7	27·5	28·6	29·4	29·3	30·6
3rd "	9·0	8·6	8·7	6·8	10·0	7·4	10·6	8·5	8·9	7·7	8·1	7·7	7·4	8·7	10·1	8·9	10·0	8·7
4th "	3·9	3·6	4·9	5·6	4·6	4·6	4·0	4·0	3·8	3·8	4·2	3·6	3·6	4·5	3·2	3·1	4·7	4·6
Klay	14·7	14·5	16·1	14·9	14·9	13·6	15·6	17·2	22·0	23·6	16·7	23·7	21·6	22·0	19·9	20·5	15·2	15·2
Loss on solution ...	4·0	4·3	4·8	3·6	3·8	4·4	3·6	4·4	4·5	4·4	4·7	2·8	3·2	3·0	4·1	3·4	4·5	4·3
Loss on ignition ...	6·8	4·2	5·5	5·8	5·4	5·9	4·5	5·8	4·7	7·7	10·5	5·7	7·8	8·3	4·3	5·2	4·8	4·7
Moisture	2·5	1·7	2·2	1·9	1·8	2·9	2·4	2·8	2·5	2·8	3·4	2·7	3·6	3·7	2·8	2·6	2·1	2·5
Total	102·6	99·9	100·5	100·5	100·9	100·4	98·1	100·6	99·0	101·4	100·2	100·2	100·0	100·4	100·1	100·4	97·4	97·5

A high degree of precision must not be expected from the method, partly because errors due to manipulation readily occur, and even more because of the impossibility of drawing true samples of soil for the analysis, first in the field and then in the laboratory. In the field any slope will mean some variation, whilst every cultivation and every heavy rainfall will to some extent re-arrange the physical constitution of the soil. It will be seen, however, that these inevitable variations are never great enough to mask the essential identity of samples drawn from the same area.

The consideration of the results is facilitated if they are recalculated after eliminating the items most subject to variations unconnected with the problem under consideration, that is, the moisture lost at 100°, the loss on solution and ignition, and the coarse material arrested by the sieves, which is too coarse-grained to be accurately distributed in a sample weighing 10 grams only.

The latter fractions constitute only about 10 per cent. of the whole soil and may be dismissed without more consideration in the present case, but they can be determined with accuracy by estimating separately in a sample weighing at least 50 grams.

The figures, however, are not markedly affected by recalculation on such a basis, and it will be sufficient to confine attention to table IV., in which the varying proportion of organic matter, sometimes high in the finer fractions, has been removed by ignition.

From a consideration of this table the following points will be apparent:—

(1.) Preliminary treatment with acid results in a greater proportion of "klay" than does the method of working directly on the raw soil, the deficiency in the "klay" fraction in the latter case being generally made up by an increase in the next coarser fraction, and a still smaller increase in the fraction above, the two coarsest fractions being practically identical by both methods.

(2.) The differences between the two methods, which are greatest when there is much organic matter in the soil, practically disappear when the soil has been long unmanured, or has been deflocculated by the continued action of saline manures. In the six dunged or grassland soils, with an average loss on ignition of 7·8 per cent., the proportion of "klay" is 15·3 per cent. when working on the raw soil and increases to 19·3 per cent. after the acid treatment; on the twelve other soils, with an average loss on ignition of 5·1 per cent., the increase is from 16·6 per cent. in the raw soil to 17·2 per cent. as determined after treatment with acid.

(3.) Soils which from their proximity we have every reason to consider as identical give similar results by the acid treatment, whatever their manuring has been, but show wide variations when the raw soil is examined. As a striking example the soils 17, 18, and 24, are all within a few yards of one another in a uniform part of the field, but 18 has been receiving but little organic and much saline manure, 17 has had heavy dressings of organic manures, and

24 has been laid down to grass for many years. By the acid treatment the proportions of "klay" are 21·6, 23·7, and 22·0 per cent. respectively, whilst the raw soil gives 20·2, 23·9, and 11·1 respectively. The acid treatment brings together into one group all the soils of similar origin whatever has been their subsequent management; the results obtained by working on the raw soil depend also on the treatment the land has been receiving. To this conclusion one exception must be made; soils 20, 22, and 27 show a lower proportion of "klay" than the other soils from the same field; this difference, which is a real one, being visible whether the analysis is made on the raw soil or after treatment with acid, will be considered later.

These results lead to the conclusion that the preliminary treatment with acid gives a truer picture of the ultimate physical constitution of the soil than that obtained by working on the raw soil. The acid employed is too weak to cause any reduction in the size of the coarser order of particles such as would bring them within the "klay" limits; were it so, the increased proportion of "klay" due to the acid treatment would not be confined to the soils rich in organic matter, but would be equally manifest with deflocculated soils like 20 and 22, or 19 and 21. These soils give practically identical results by both methods, which is the best evidence that no new error is introduced by the acid treatment. But when working on raw soils well provided with organic matter much of the "klay" is cemented into larger groups by the humus, and these aggregates so far resist the repeated operations of pestling as to be weighed in the coarser fractions. It is not probable that any amount of rubbing up or boiling will completely resolve them, hence the actual amount of "klay" determined will, to some extent, depend on the thoroughness with which these processes are pursued. As, however, the necessary resolution is fully carried out by the acid treatment, as it also removes all salts capable of causing flocculation, it may be concluded that washing in dilute acid is an essential preliminary to the mechanical analysis of soils.

Further justification is seen in the fact that, when working on the Rothamsted soils, the acid method shows the essential identity of all the soils from the same experimental field, whereas separations made on the raw soils give very dissimilar results, depending on the treatment to which the various plots had been subjected.

ANGORA GOATS.

The following particulars as to the value of Angora goats has been republished in response to inquiries for information on these valuable animals:—

SHEEP AND ANGORAS COMPARED.

Professor Thomas Shaw, of Minnesota, thus compares sheep and Angora goats:—

(1.) There is not much difference in the size of the two animals when matured, but the sheep matures much more quickly than the goat.

(2.) The goat lives to a much greater age than the sheep. Some authorities claim that the average length of age of a goat is about twice that of a sheep.

(3.) The goat is a browser, and will from choice gather its living from leaves, twigs, bark of trees, and weeds, whereas sheep prefer pastures, although they will eat many weeds also, but will also eat leaves and brush, but not in preference to pasture.

(4.) The meat of the sheep is as yet preferred, on the whole, in the markets, but the goat meat is coming more and more into favour.

(5.) The goat produces hair, and the sheep wool. The fleece of the latter weighs more on an average than the fleece of the former, and will probably bring more on the market.

(6.) The great use of sheep on the average farm is to clean up scattered vegetation, especially what is of the gleanings order, while the best use of goats is in cleaning up brush land.

(7.) Sheep will not do well if confined wholly to brush land, while just such land furnishes exactly the conditions which the goats enjoy.

The accompanying extract from the American *Prairie Farmer* gives an account of the history of the Angora goat:—

HISTORY OF THE ANGORA GOAT.

The Angora goat is a native of Asia Minor, and up to 1880 it was possible to purchase them in that country, but the Turks and Armenians became envious of the great advancement made in South Africa, and prevailed upon the Sultan to prohibit the exportation of any more goats. We are indebted to the enterprise of a few progressive Americans for those that were brought into the United States, and although the entire number aggregates less than 100 head, they have been sufficient to demonstrate the entire feasibility of breeding them in all sections of our country, and it is believed by

many that our climate is capable of producing a class of mohair superior to either Turkey or South Africa. The first lot of goats imported numbered about 30 head, and were presented to the Hon. J. B. Davis, American Minister to Turkey, in 1847, by the Sultan himself. They were doubtless of the best and purest blood that could be obtained, and soon after their arrival in this country Mr. Davis disposed of them to his friend, Col. Richard Peters, of Atlanta, Ga., who bred them with great care up to the time of his death, which occurred in 1891 or 1892. The progeny of this lot of goats has been scattered over the whole country, and was the initial step of the foundation of our mohair industry. The present available supply of mohair from all sources may be placed at between 18,000,000 and 20,000,000lbs., only 500,000lbs. of which is produced in this country, the remainder being divided about equally between Turkey and South Africa. It has been fully demonstrated that the Angora goat will thrive in all sections of the United States, but will perhaps do better in high and dry districts than in low lands. They are a great advantage in keeping down undergrowth in pastures, and have been purchased for this purpose in many cases by parties in Iowa. A common herd of goats can very easily be improved by the introduction of Angora blood, and it is very difficult to distinguish the fourth cross from pure-blooded goats. The value of these goats consists mainly in the length and lustre of the hair they produce, but this is not attained in improving a common flock until the fourth crossing, which makes it very expensive to undertake, and may account to a large extent for the slow progress that has been made by Americans in building up the industry. The bucking season begins about July, but this is not a good time, as the young kids come during the winter, and unless they are sheltered, and the mother furnished with proper food, they will die. The period of gestation is five months and a few days, and it is advisable to separate the males from females about the 15th June, until such time as will be proper to bring the kid after vegetation has started in the spring. The Angora rarely produces more than one kid at a time. The male is capable of producing at the age of six months, and the female will begin breeding about the age of one year, though it is advisable to keep her from it until the following season, if it can be done without great trouble. Shearing must be done as soon in the spring as the hair commences to shed. If left longer the oil in the hair goes into the body of the animal, and the hair loses its life, weight, and lustre. If the weather is cold, proper shelter should be afforded the animals for a short time after being shorn.

The hair should be packed according to quality, length of staple being the best guide as to grade. If the flock is of uniform grade, the hair may be packed in a sack loose, but if there are two or more lengths of staple it is advisable to tie each fleece separately so as to assist in a proper classification when sent to market. The writer was first attracted to the Angora goat as being a most excellent substitute for the wild fur-bearing animals so rapidly becoming extinct. The buffalo, which has supplied buggy and

carriage robes for so many centuries, has been exterminated, and nearly all other kinds of fur are very rare and expensive. The demand for this class of product has always been enormous, and a glance over any fur dealer's price list will convince anyone that the fur industry is one of great promise. There is no domestic animal that can supply this great demand of the human family better than the Angora goat, inasmuch as the skin can be taken in such a variety of stages. For instance, when the hair is of one month's growth it can hardly be distinguished from the Astrachan, if dyed black; or it can be taken at an earlier period of growth, and be made to represent the Polar or Black bear, according to the character of dye used. It may not be known that nearly all the buggy robes that are now sold as wild animal fur are nothing more than goat skins dyed. And perhaps young ladies who admire the so-called "real monkey skin" muffs and cloaks will be surprised to learn that they are only straight-haired goat skins dyed black. One of the most profitable uses that the Angora goat skin is put to is in making lace trimmings, which commands a price per yard equivalent to 15 dollars for a single hide. Another use is in making floor rugs and coverings for the backs of sofas and armchairs. The beautiful lustre of the curly hair is brought out in a most effective manner by the reflection of gaslight, and nearly all housekeepers who have not already some of these rugs, etc., are anxious to possess some. The supply of this class of rugs is limited, and the price, until recently, was very high—10 dollars and 12 dollars being often paid for choice skins. The present market value of Angora goat skins in a raw state is about 2 dollars each for well-haired skins, and were it not for the enormous importation of foreign skins, particularly Chinese, which are brought here by the thousands of bales, owing to there being no import duty on them, the price for our home product would be much higher. It may be well perhaps to state that the Chinese goat skin does not compare in fineness with the Angora, yet they are used extensively for cheap buggy robes and rugs, which naturally depreciates the selling value of the better article. The Angora goat-raisers intend to ask protection from such unfair competition, at the hands of our next Congress, and it is not unlikely that their demands will be granted. If the Chinese are not permitted to become citizens of this country, it is an outrage that we should be compelled to compete with their cheap labour at home. With a reasonable tariff to keep out the flood of foreign skins, there is no industry that can be made more profitable than the raising of goats for their skins alone. The meat of the Angora is of a very delicious character, although there is still a lurking prejudice in the minds of some on account of the strong flavour in the flesh of the common goat. This prejudice is rapidly being removed, however, and it will not be many years before Angora goat meat will be as much in demand as the choicest mutton is to-day.

Goats are among the most profitable stock on a farm. Those who go into the goat business extensively always find it profitable.

A small flock on every farm that has brush is nearly all profit. There is no animal that converts the weeds and brush into ready money like the Angora goat. They will eat almost every kind of weed that grows—even the jimpson. They seem to be a blight to brush; they eat the leaves, and the parent stock soon die off. If they do not clean-cut your fence corners it is because they do not have a chance. Their wool is more valuable than sheep's wool, and one goat will eat more brush than five sheep. We are glad to be able at last to report a decided and legitimate improvement in mohair, with an excellent demand at advancing prices, and the prospects of a steady, active trade during next fall and winter. Values in Europe have rapidly risen to the highest point known in years, with only small stocks available until next Turkish clip. In view of the situation, we feel safe in quoting for average domestic combed mohair 30 to 33 cents: good average, 35 cents; superior, 38 to 40 cents; and really choice selected, 42 cents or more. We advise all Angora goat-breeders to use only pure-bred bucks, and only the very best. Our best consignors, those that are making the most money out of the goat business, are the men who have expended the most money for pure-bred bucks, and have been the most careful in breeding long, lustrous fleece. At present prices there is a fortune for the man who can raise fine mohair, and only disappointment and failure for the man who raises kemp. Shippers and mohair growers generally should shear only such of their flock as will yield a fleece of six inches staple or upwards, and thereafter, when it is practicable, let it grow to a full year's length if they want a full-grown price.

A number of breeders pretend to have pure-bred goats, but in the face of the fact that there never have been more than 100 goats imported into the United States, and these were brought in from 20 to 50 years ago, it is a great stretch of imagination to suppose they have not been kept pure? We are of the opinion that there are no goats in the United States to-day that can be called pure-bred with anything like absolute certainty. A very high regard is always manifested for pure-bred stock, and importation from abroad has invariably proved to be an excellent card for the breeder. We consider this a great error, and in defence of our opinion will point to the Spanish merino sheep, which has been so greatly improved by American breeding over the original stock that the American merino sheep is now preferred by breeders in all nations. The same experience has been realised with the hog, shorthorn cattle, racehorses, and, indeed, nearly all kinds of stock that the Americans have undertaken to improve. We predict the same result with the Angora goat. Our first start in goats came from the Peters' flock in Georgia at 60 dollars per head, and we can show animals to-day far superior to those purchased from Mr. Peters. Our experience has been that any goat of good qualities will breed well, and if a beginner will select only animals that are well coated with hair he need not be afraid of results.

THE BABCOCK TEST.

WHAT IT IS, WHAT IT DOES, AND HOW TO USE IT.

The making of a practical device for measuring the fat of milk, simple enough for the use of those not trained as chemists, was the work of Dr. Babcock. By the former method, the tests for fat were made by ether extraction and could not be handled by the ordinary butter-maker. Dr. Babcock worked out the idea while a member of an experiment station corps, therefore it is not patented. Few people appreciate what an uplift farming has received from the labour of men like Dr. Babcock, Professor Conn, Professor Henry, and many other tireless investigators. The experiment station as a form of internal improvement has received little recognition from the general public, yet a large number of able scientific men are doing faithful work to make the earth more fruitful and rural life more beautiful. I believe that the work of these stations in making for peaceful progress, or construction of better conditions of country life, are of far greater importance to the national welfare than the widely heralded acquisition of new guns and war ships. These are mere agents of destruction and also of demoralisation of the men that are employed. Yet millions are spent for the art of war by the Government, while the different States hesitate to spend a few thousand for the science of agriculture. Even now the Ohio station is without an appropriation. Yet the immigrants do not cease to pour in at New York. These are men without knowledge of farming in a new country. If some of them do not grow crops or raise cattle to feed the all congested masses of the cities' non-producers, the people will presently have to learn, like the Irishman's mule, to wear spectacles and eat shavings. That experiment was a success—in saving grass—yet it was marred by the fact that by the time the mule was trained to this strange diet, he found life was not worth living.

THE BABCOCK TEST.—The simplest explanation of this test, without going into details, is that the sulphuric acid eats or burns up all the constituents of the milk except the fat. The hot water added afterwards does not affect the test, as it simply acts as a filler that does not interfere with the fat, but merely raises it into the calibrated neck of the bottles for reading.

The application of the centrifuge to separating fat liberated by the sulphuric acid was perfected by Dr. Babcock. The making of the machines was taken up by various companies. The one I first used was of the earliest makes; it was a ten-bottle tin affair, turned by hand, that slipped its bearings constantly and had to be closely watched, or it failed to obtain the necessary speed.

My instructor and fellow sufferer at this time is now the able chemist of the State Dairy Bureau, William H. Saylor, then a lad from an Eastern dairy school. We laboured over that old tin rattle

trap, turning it by hand, and filling up the bottles with hot water from a tin teapot that boiled on an oil stove. Primitive as were the appliances, we made clear tests. The tester I use at present is a twenty-four-bottle steam turbine, that heats its own water; with it testing is quickly completed, even with samples from a large herd.

LEARNING TO TEST.—Begin by taking a quart of milk, after shaking it carefully to mix the cream evenly through it, measure it out in the little measure provided, up to the mark engraved on the glass, or the milk may be drawn up in the pipette to the mark, be sure there are no air bubbles. Take a test bottle by the neck, holding it in a slanting position; let the milk flow in slowly without spilling, for every drop counts. After you have filled enough bottles with milk for a charge, then begin to fill them with acid. The sulphuric acid should be purchased by the carboy from a reliable dairy supply house, to insure its being of uniform and proper strength. I use a heavy glass bottle with a glass stopper to hold the acid, as the carboy is too heavy to be readily handled. It should be remembered that acid flows more like syrup than water, and if it falls on the hands, by having a basin of water to plunge them into at once, the burns will be mere surface reddening. I pour the acid from the gallon bottle into a four-ounce measuring glass with a good lip; from this it is easily poured into the measuring tube. In a creamery where a large amount of testing is to be done it is usual to have a measure that works with a glass stopcock to facilitate this work, but as these are expensive and very breakable, for ordinary herds this way answers every purpose.

The acid is measured into the little glass and poured into the test bottle. Holding the bottle by the neck at a gentle slope, it will be observed that the acid runs down the bottle neck and follows the sides to the bottom without spreading. This is the way it should do, for if it is dropped directly down in the centre it will burn the milk it falls upon. Twirl the bottle gently, holding it by the neck, to mix the acid with the milk, keeping it down in the bottle and not shaking it up into the neck of the bottle. When the milk has turned a dark brown, green, or black, it will be hot to the touch. Then set the bottle in the machine. When all the bottles are filled, start the centrifuge, timing it carefully. The first filling of the bottles with hot water is to the necks; then we prefer to give them another run in the machine. The second time fill them up high enough to bring the columns of fat into the necks. Remove the bottles to the table, and with a small pair of dividers read the test of fat.

If the tests of these samples of milk read alike, the testing of the herd may be taken up, yet without the test is clearly and evenly made on the milk, it is better to practise until perfect, as it is a waste of time to take composite samples and then do poor work.

SOME FAULTS.—Some of the faults to be expected are, first, white ashy tests. These are often caused by not enough acid; sometimes in the winter time the tests are too cold, and by turning

the steam into the machine and giving them an extra run they clear all right. When the tests are black, either the acid was dropped into the milk so as to burn it, or there was too much used, or there was too much bichromate of potash used as a preservative for keeping the milk.

When the composite samples are tested, each jar is carefully shaken until there is no rim of cream left on the sides of the bottles. The number of the cow is copied on the test bottle, being written with a soft lead pencil on the ground glass spot on the side of the bottle. When the test is read, this number and the per cent. of fat are written on a stub to be taken to the office and transferred to the cow ledger.

The test bottle should be emptied at once. I have a wooden tub with a cover bored full of holes large enough to let the necks of the bottles through. As soon as one lot is ready they are turned upside down so the contents escape into the tub, they empty themselves readily while warm and make the washing easier than if left until the fat hardens. The samples of milk left are also put into the tub, which find a resting place in some corner, where the gardener deposits the bones the dogs carry on the lawn, and adds them to the acid, later he uses it to make the roses bloom for it is a good fertilizer.

In making tests there should be plenty of test bottles, enough to hold all the samples, so when the filling begins with the milk, it can be finished before the acid is used. As the test bottles are filled with milk and numbered, the sample jars are stood on the back of the table in a line and the test bottles in a corresponding line, so if there is a bad test or a spoiled one the jar from which it was taken can be found at once.

One source of irregular readings is defective bottles. This annoyed me greatly, though I purchased the guaranteed bottles. One can test the bottles quickly and be absolutely sure of the work, so I test every bottle before putting it into the racks. The correct or standard bottle was measured by a dairy school expert at the Pennsylvania Station. This standard bottle is filled with water to the O mark, then enough quicksilver is poured into the bottle to raise the water to the highest mark on the bottles to be tested. This is repeated on each bottle, those that overflow or do not reach the given mark are defective. The bottles sold at present may be better, as it is now three years since I purchased a gross, but all I have tested ran about one bad bottle to a dozen. In washing test bottles they can be laid on their sides in a bucket that has a bung in the lower part. Fill the bucket with water in which sal soda has been disolved, put in the steam hose and make them hot, after standing for ten minutes, draw off the water and fill up again and again heat them up. Let this water run off and lift them out, putting them necks down on the rack so they will drain. A few may have to be cleaned with a turkey feather, but it will be very few.—*Exchange.*

THE STOCK DISEASES ACT, 1895.

ORDER IN COUNCIL.

At the Executive Council Chamber, at Perth, this 14th day of September, 1904.

Present:

His Honour the Acting Chief Justice (Governor's Deputy).

The Honourables—

The Colonial Treasurer,	The Minister for Works,
The Minister for Mines,	The Colonial Secretary,

The Minister for Labour.

WHEREAS by "The Stock Diseases Act, 1895," the Governor is empowered, by Order in Council to be published in the *Government Gazette* from time to time, to make, vary, alter, or revoke such Regulations under this Act as may be deemed expedient for all or any of the following purposes:—For the purpose of subjecting any stock to such restrictions or remedial measures as may be deemed necessary to prevent the introduction or spread of disease; for providing for the steps to be taken in case of any disease breaking out among any stock in the State, and for preventing the spreading of such disease; for prescribing the manner in which persons coming into contact with infected stock, and land, premises, or conveyances travelled over or used by infected stock, shall be cleaned and disinfected; for the regulation, management, and control of quarantine grounds, and for prescribing the treatment and disposal of stock whilst in quarantine, or in transit thereto or therefrom; for prescribing the term during which stock shall be quarantined, and generally for all or any such purposes as he may deem necessary for preventing the introduction or spread of disease: Now, THEREFORE, His Excellency the Governor, with the advice of the Executive Council, does hereby make the following Regulations under the said Act.

ARTHUR H. WILLIAMS,
Clerk of the Executive Council.

REGULATIONS.

1. It is the duty of the owner of poultry infected with tick, within twenty-four hours of the time when he shall have discovered or suspected such poultry to be infected, to give written notice thereof to the nearest Inspector, and thenceforth to keep such poultry from coming into contact with other poultry until otherwise ordered by the Inspector (*see* 59 Vict., No. 34, Section 11).

2. If an Inspector shall discover on any premises poultry infected, or suspected of being infected with tick, he may serve upon the owner of such poultry a notice in the form or to the effect of the schedule hereto.

3. It shall be a sufficient ground to suspect that poultry are infected with tick if tick is found in or about the fowl-houses used by such poultry, or the appurtenances used in connection with such fowl-houses.

4. During the fourteen days next following the service of such notice it shall be unlawful for any person to remove any poultry from the premises referred to in such notice.

5. Within the fourteen days next following the service of such notice the following steps shall be taken by the owner of such poultry for cleansing and disinfecting the premises and preventing the spreading of such disease, that is to say :—

(*a*.) All fowl-houses and the appurtenances used in connection therewith shall be dismantled or treated in such manner as directed by the Inspector, and all visible ticks destroyed.

(*b*.) All material with which such fowl-houses and appurtenances were constructed shall then (if not destroyed by fire) be saturated with boiling water, and, in order that all ticks and their germs hidden in crevices may be destroyed, thoroughly saturated with a three per cent. solution of carbolic acid and water, tar, or other effective destroyer.

(*c*.) Should the fowl-houses be in close proximity to or attached to fencing, such fencing must be treated in a similar manner.

(*d*.) The whole of the ground area of infected houses, etc., must be strewn to a thickness of half-inch with fresh quick-lime, and then slaked with water ; also the ground within three feet of each side of infected fencing must be treated in a similar manner.

6. If the owner of any poultry shall make default in taking such steps as aforesaid, pursuant to such notice, all work that the Inspector shall deem necessary to be done to comply therewith may be undertaken by or under the direction of the Inspector, and the expense incurred shall be recoverable in a summary way at the suit of such Inspector before any Justice of the Peace.

7. All fowl-houses and the appurtenances in connection therewith which shall be dismantled in accordance with Clause (*a*) hereof, shall not be re-erected unless the same shall be constructed in such manner as to prevent the harbouring of tick, and shall be provided with tick-proof perches to the satisfaction of the Inspector.

8. Any person committing any breach of the foregoing regulations, numbered 3 and 4, shall, for every offence, be liable, in addition to any expense incurred under Regulation 5, to a penalty not exceeding Twenty pounds.

SCHEDULE.

Stock Department, Perth,

..................................1904.

To

Mr..................................

I hereby give you notice that poultry kept by you on the premises situated at .... are suspected to be infected with tick, and you are required to comply with the Regulations made by the Governor in Council under "The Stock Diseases Act, 1895," on the .... day of ....

A copy of such Regulations is hereto annexed.

....

Inspector.

EXTRACT FROM REGULATIONS UNDER FERTILISER AND FEEDING STUFFS ACT, 1904.

Department of Agriculture
Perth, 20th July, 1904.

HIS Excellency the Governor in Council has been pleased to approve of the following Regulations under "The Fertilisers and Feeding Stuffs Act, 1904."

ALEX. CRAWFORD,
Acting Director of Agriculture.

Any person who—

(1.) Sells or describes as bonedust or bonemeal any fertiliser containing less than 40 per centum of tricalcic phosphate derived from bones, or of which less than 80 per centum will pass through a mesh of one-eighth of an inch ; or

(2.) Sells or describes as super-phosphate or super any fertiliser containing less than 20 per centum of water soluble phosphate, and a less total than 30 per centum of water soluble phosphate and citrate soluble phosphate ; or

(3.) Sells or describes as Thomas's Phosphate any fertiliser composed of basic slag containing less than 30 per centum of tricalcic phosphate, and so prepared that less than 80 per centum shall pass through a sieve of 100 meshes to the lineal inch, or 10,000 meshes to the square inch, or more than 5 per centum of which fails to pass through a sieve of 60 meshes to the lineal inch, or 3,600 meshes to the square inch ; or

(4.) Sells for use as food for cattle any article which contains any ingredient deleterious to cattle, or to which has been added any ingredient worthless for feeding purposes, and not disclosed at the time of sale,

commits an offence against this Act.

"HUMUS."

ITS CHARACTER AND FUNCTIONS IN THE SOIL.

Humus is a substance much discussed in questions of fertility and undoubtedly of supreme importance, yet as to its precise nature little is known. When animal or vegetable matter decays naturally in the presence of air, a portion passes off as carbonic-acid gas, but the greater portion remains behind in solid form, at least for a time, losing all trace of its original shape, as of leaves, stems, and roots. It turns to a brown colour, loses the smell of decaying matter, giving merely the characteristic smell of garden loam, and has a neutral or slightly alkaline reaction. In this state of decomposition, having lost all resemblance to its origin, and not yet oxidised to carbonic acid, it is called humus, or, by way of distinction, "mild" or "sweet" humus. It is the essential part of garden mould, as distinguished from mere mixtures of clay and sand.

Humus is neither a definite compound nor a well-known mixture of several such. In itself, aside from its place and origin, it offers little in the way of chemical reaction that serves to identify it. While the supreme importance of such substance is recognised, nevertheless its real nature and constitution is not definitely understood. With the possible exception of nitrogen, humus contains everything originally in the plants from which it comes, though in different proportions. It appears to be in a state of constant change, and to pass so rapidly into different stages of decay that it is difficult to assign it to any definite composition. It may be regarded as the solid residue of organic matter, chiefly vegetable, left by a slow and partial combustion. Much of the oxygen and hydrogen having passed off in a gaseous state, it contains relatively more carbon and less of these two elements than the plant from which it comes. It is in a sense largely vegetable matter deprived of more or less of its water. It is so intimately mixed with the mineral portion of the soil that it is well-nigh impossible to determine just what are the proper constituents of humus and what are merely admixtures.

Of the elements contained originally in the decomposing plant, the potash and other bases leach out rather readily; the phosphoric acid with much more difficulty. As to the nitrogen, in the case of "sweet" humus much of it must be supposed to pass to the state of nitrate before humefaction is complete—that is, while the vegetable tissue retains something of its form. Nitrogen is bound up in humus, especially the "sour" humus; whether strictly a component part or merely held more loosely is not readily discovered. Just as in the case of nitrate nutrition, so here it has

been questioned whether solid carbon compounds in the soil ever pass directly into a plant through its roots as ready formed food. Some investigation seems to show the possibility of such a thing, though not any considerable amount of such carbon compounds is taken up in that way.

The fact, now practically uncontested, that a soil rich both in mineral constituents and in decomposing organic matter will promote plant growth to an extent impossible with the fullest supply of mineral matter only, does not necessarily show that the decomposing organic matter is properly plant food, though it may play quite as important a part--even an indispensable part. The strictly chemical value of humus is probably not due to its function to any extent as a direct nutrient, but rather indirectly. The view of plant nutrition newly accepted a half-century ago regarded soil constituents as valuable only in so far as they actually fed the plant by entering into it. This, the "mineral theory," regarded plants as dependent only on such elements as they actually take up. More recent advances in knowledge show, as had been expected, that this is a great error. Some of the most valuable and important constituents of a soil have only an indirect use—that is, they help growth, but never enter into or become a part of the plant.

Humic acid sets free mineral acids that may be present in small amounts in the soil, and these, in turn, help to decompose insoluble minerals, particles of rock, and the like. The large amount of carbonic acid evolved by humus directly in the soil tends to the same end, and even more energetically in the presence of ammonia. Direct experiments show that water charged with carbonic acid decomposes most rocks fully twice as rapidly as pure water. Humus is a constant source of carbonic acid, which it disengages in enormous quantities just at the point where it is needed; thus it aids powerfully in the decomposition of particles of rock, and so in the renewing and enriching of the mineral matter of the soil.

The well-known absorbent power of humus—which is often used for disinfectant purposes, as when ill-smelling substances are buried—is one of its most important properties. It has, in fact, with a single exception, the highest known power of absorbing gases. Through this means the ammonia, which is formed as the first step in nitrification, is retained in the soil until it is oxidised to nitrates, with the loss of little or none, whereas but for this much of it would be lost. Furthermore, while potash forms a soluble "humate" in combination with humic acid, in the presence of other bases (as lime, aluminum, and iron), "double humates" are formed, which are insoluble. Thus the loss of potash from leaching is in a measure prevented by an abundance of humus. Humus is not in itself a store of plant food; its value lies, not in what it gives up to plants, but in this state and quality that it imparts to the soil.

Humus affects the temperature of the soil in a beneficial manner. By reason of its dark colour it often shows under direct exposure to the sun a higher temperature than light-coloured soils

under equal conditions. But its general tendency is toward diminishing extremes, so that it makes a soil cooler in the daytime and warmer at night, and cooler in summer and warmer in winter, than pure mineral earth, especially sand. A pure sand shows the opposite extreme in all of these respects, while a clay soil is intermediate as to absorbing, radiating, and conducting heat. But in general the heat properties of humus are all favourable to vegetation.

Clay soils and sandy soils are in physical texture at opposite extremes, a loam being in this respect between them. Humus benefits each, but by working in opposite directions. It makes clay less stiff when wet and more crumbly when dry; more porous with freer access of air. Thus it favours those changes that are dependent on the oxygen of the atmosphere, such as nitrification. It lessens the puddling of clay and makes it more pervious to water, thus favouring drainage in a wet season and the upward capillary movement of the water in a drought. On sand its effect is always in the opposite direction, making it more coherent, more retentive of water, with less tendency to leaching. The effect of humus in preventing leaching is of the utmost importance. The danger of an excess of humus springs from this fact: that it may favour the retention of water so much as to exclude the air and bring about putrefaction, rather than "sweet" decomposition of the organic matter in the soil. In the words of Storer, "the very qualities which make humus so valuable in soils that are naturally too dry unfit it for application to moist soils. There are but few things worse than humus upon a wet soil."

The physical qualities that humus imparts to soils, if we include the fact that it makes them habitable for the micro-organisms so important to the whole question of plant food, seem to be its most useful function. These physical properties are so well understood in common life that it is hardly necessary to do more than mention them. Nothing will take the place of humus as the means of making mineral matter into a soil—*i.e.*, a fit habitation for growing plants. Chemicals will supply plant food, but they alone will not make a soil. It would seem, with exclusion of the nitrogen question, that the physical properties of humus are far more valuable to most soils than the chemical. When we speak of its benefits we refer chiefly to a physical state that it promotes in soils, and but incidentally to any contribution of plant food that it may make.

The amount of humus in different soils varies greatly—far more than any other constituent. In many cases it is a fraction of 1 per cent., and in others more than half of the soil by weight—even as much as three-quarters. These very rich soils—the so-called black earths—are, of course, exceptions, due to dead vegetation accumulated through many years. It is questionable whether mere mounds of such decaying vegetation are properly to be called soils. The famous "black earths" of Russia average much less than 10

per cent. of humus. The prairie soils of the west run over 5 per cent. Excellent agricultural soils contain less than 2 per cent. More than 15 per cent. is considered detrimental as affecting the water-holding power of the soil unfavourably, and probably in most cases even much less than this will be harmful rather than beneficial. Most of our common farm land in the East has less than 2 per cent. Only in exceptional cases, such as market gardens, truck patches, and the like, is this amount needed.

The meaning attached to "humus" and the methods used by different people at various times to determine it are so various that comparisons of different analyses are not always reliable. The wide variations found in different sources of information are sometimes due in part to differences in analytical methods, and consequent differences in the significance of the term. "Humus" in some cases has been made to mean all organic matter in the soil, including vegetable fragments yet undecomposed; in others, all that is volatile on ignition, and again only such organic matter as will dissolve in weak alkali. These analytical discrepancies, largely unavoidable, allow us to attach only a very general meaning to the percentage of humus found in a particular case.—*Tree and Vine.*

FEEDING OF POULTRY.

The following article is taken from the Royal Agricultural Society's leaflet No. 114, and must prove of great value to all poultry raisers:—

There is a widespread belief that poultry-keeping can never be made a great industry in the United Kingdom by reason of the large amount of labour entailed and the great cost of up-keep in the way of food.

No idea can be more incorrect, though there is at present an unfortunate tendency in many quarters to look upon poultry-keeping as a sort of hobby, and, moreover, there is a serious wastage in the matter of food and labour.

So far as cost of keep is concerned co-operation in buying will work wonders, while, as to the saving of labour, experience is all that is necessary.

It is much more important to determine what is the proper kind of food to give, and it should be remembered that in order to

make the largest possible profit one must feed for a specific purpose, viz., either for eggs or for flesh; not, as many do, merely with a view to keeping one's birds alive at the smallest cost and with the least possible expenditure of trouble.

In fact, if good laying hens are desired, they must be selected and fed with great care, and as in every dozen marketable eggs there is about one pint of water, it will be seen that a hundred laying hens will require a large amount of water daily.

In this connection it should be noted that impure water is liable to make the eggs taste strong, whilst it may also contain the germs of disease. It is therefore absolutely necessary that only fresh, pure water be given to poultry.

It may also be remarked that whereas an ordinary hen of the lighter varieties (such as Leghorns or Minorcas) requires daily from $3\frac{1}{4}$ to $3\frac{1}{2}$ozs. of food when laying, she will, if not laying, need only about $2\frac{3}{4}$ozs. daily. During the moulting season, however, the bird may be allowed as much food as she will eat clean. The more active a bird may be the more food she will require in proportion to her weight.

Further, it must be remembered that in order to keep birds in the best possible state of health, both that they may not contract disease themselves and also that they may produce young ones with no inherited tendencies towards disease, we must feed them on foods containing the correct amount of matter for the production of heat, flesh, fat, bone, muscle, and feather. For this reason a list is given below of a variety of foods in common use, to ensure feeding birds properly in order to allow of their producing a large number of good eggs.

If practicable these mixtures should be varied as much as possible; it would be wise to give Nos. 1, 2, 3, 5, 7, 8, and 9 on successive days, using Nos. 4 and 6 as changes in case of very cold weather; and, although the quantities given will be found sufficient for a pen of 10 birds of ordinary size, if Brahmas or Cochins be kept rather more food will be necessary, and the requisite quantity should be added in due proportion to the morning and evening feeds.

The size of the eggs laid depends largely on the breeding and feeding. A plentiful supply of hard grit and good oyster shell (which is of use in supplying lime for the formation of egg shells) should be kept always within reach of the birds, and care should be taken to breed not only from those birds which lay the most eggs but also from those producing fairly large ones. It will then be found, after a year or two, that but few eggs will be obtained which are under the usual marketable size, that is of about 2ozs.

In feeding poultry of any kind it is as easy to give too much as too little food, especially when birds have their liberty.

One ounce of table salt should be added to the allowance of every 100 birds. If more food be given for the morning feed (*see* Nos. 7, 8, and 9) less must be given at midday.

FOODS FOR PENS OF TEN FOWLS (AVERAGING ABOUT 7LB. EACH IN WEIGHT) FROM THE COMMENCEMENT OF THEIR LAYING SEASON.

MORNING.		MIDDAY.		EVENING.	
Weight of Food. Ounces.	Foodstuff.	Weight of Food. Ounces.	Grain.	Weight of Food. Ounces.	Grain.
1.— 2 3 * 5	Lean meat. Cabbage. Sharps (middlings).	12	Oats.	15	Barley.
2.— 2 2 3 * 3	Cut green bone. Clover chaff. Barley meal. Bran.	12	Oats.	15	Wheat.
3.— 2 * 3 * 3 2	Lean meat. Bran. Cut clover hay. Barley meal.	12	Barley.	15	Wheat.
4.— 2 * 3 3 2	Cut raw bone. Bran. Chopped cabbage. Sharps (middlings).	12	Oats.	15	Maize.
5.— 2 * 3 3 2	Lean meat. Bran. Chopped cabbage. Boiled potatoes.	12	Barley.	15	Wheat.
6.— 2 * 3 * 3 2	Lean meat. Cut hay chaff. Bran. Pea or bean meal.	12	Oats.	15	Maize.
7.—* 7 3 4 2	Bran. Chopped cabbage. Rough oatmeal. Lean meat.	8	Barley.	15	Maize.
8.—* 3 3 2 2 2	Bran. Cut green grass. Buckwheat meal. Barley meal. Cut green bones.	8	Oats.	15	Wheat.
9.—* 2 3 4 * 3	Bran. Barley meal. Rough oatmeal. Cut hay chaff	8	Barley.	15	Barley.

Those marked thus (*) should be scalded.

For laying hens, during the winter, a very good morning food-mixture can be made as follows:—

10.—	Scalded bran	4 parts
	Well-cooked maize meal	2 „
	Pea meal	2 „
	Sharps	1 part
	Cooked lean meat	1 „
	Chopped and scalded clover hay	2 parts

with a light midday feed of oats or barley, and an evening feed of either wheat or buckwheat or, if the *weather be very cold*, of broken maize.

The midday grain should be scattered among litter so that the birds may be forced to take a fair amount of exercise. Quite a small space, comparatively speaking, will do for this purpose, but *it must be light* and, as far as possible, sheltered from cold winds and driving rain. Boards should be placed on edge round the shelter to prevent the birds from scratching out the litter, which may be of hay, straw, long shavings, or dried fern, with some "cavins" (rough chaff from threshing) and dry road scrapings added to allow of the birds taking a dust bath occasionally. The evening feed should be given in a trough about an hour before roosting time.

As a rule those hens which are allowed a grass run can, during the summer, obtain as much green food as they require, but during the late autumn, winter, and early spring greenstuff of some kind must be given them, as there is much less nourishment in grass during these seasons. The best substitute for summer grass is hay chaff, containing as much clover as possible, for this is "harvested" when in its prime, and it has a large proportion of lime in its composition. Failing clover chaff, cabbage or spinach would be an excellent substitute. Boiled potatoes are of great use in fattening, but should only be given to grown fowls in small quantities, and even in such a case but once or twice a week.

The cost of feeding grown fowls, provided there be no waste of food, should rarely exceed 1d. per bird per week, or about 4s. 6d. a year.

Chicks.

With all birds, young ones especially, the greatest care must be taken to keep all coops, brooders, houses, food and water vessels perfectly clean and sweet, or the birds will become weak and ill. Some breeders put a little camphor in the drinking water of young birds under the impression that it prevents them catching cold. Should any birds, young or old, die, they should at once be burned or deeply buried. Both chicks and young turkeys will do best if fed for the first month on dry food; they will grow faster and be far hardier than if given soft food, however carefully it may be mixed.

If the owner has no means of making ordinary mixed dry chick food—about which more will be said later—he will find that canary and millet seeds, groats, cracked peas, and a little hempseed will be all that is necessary to begin with.

Maize should be sparingly fed to young birds, even in very cold weather, and rice must not be given too freely.

The feeding of dry food will be found very economical, for it saves labour, whilst the birds like it and thrive particularly well upon it. Though newly-hatched chicks require little food at a time they should be fed as often as possible, certainly not less than five times a day, for the first few weeks. A little dry food should be put near them the last thing at night, so that when they come out in the morning they may find it immediately.

It is not possible to say how much food is required by newly-hatched chicks or turkeys, but chicks generally eat about 3lbs. of dry food each during the first eight weeks of their life.

If the weather be very cold and stormy do not let young birds run about in the wet—a sack supported on sticks will cover sufficient space for exercise, though a thatched hurdle will be still better. A little chaff, in which seed has been scattered, may be placed on the ground under their shelter.

Their litter should be turned over with a stick every day or two to freshen it and to allow the chicks to find any food which may have escaped them. On no account should soft food be thrown among the litter—it will become sour and do the birds far more harm than good. Should the litter become damp it must be taken away and dry chaff put in its place, or the young birds will catch cold.

It is quite unnecessary to give them chopped egg, custard, or bread crumbs. Nature provides them with the requisite amount of egg food, and bread is much too heating for such young birds. They should not be fed until at least twenty-four hours old.

For the first eight days feed upon :—

11.—3 parts canary seed.
3 ,, millet ,,
2 ,, finely-cracked peas (green peas are best).
1 part hempseed.

or

12.—3 parts canary seed.
3 ,, groats.
2 ,, hempseed.
1 part finely-cracked peas.

They may be fed entirely on canary seed and groats if desired, but if so fed the groats should be given separately. If the above mixtures are given no change is necessary until the birds are fully eight days old.

From this time until twenty-eight days old the birds will grow faster if to these foods be added finely-broken wheat, broken white

rice (in very small quantities), and yellow maize. A good proportion would be as follows:—

13.—Rough oatmeal	7 parts.
Finely-cracked wheat	8 „
„ maize	4 „
„ green peas	4 „
Canary seed	2 „
Millet „	2 „
Hemp „	2 „
Finely-broken white rice	1 part.

Once a day a meal of finely-chopped cooked lean meat may be given and even if the chicks have access to grass it will be found wise to give them a little chickweed, fresh grass, dandelion, lettuce, spring onion tops, or green clover chopped up small.

A very few days will teach one how much of each of the above foods is needed by the birds. One of the most important rules is to give them, at each meal, only as much as they will eat clean and to clear away the rest. Here again it must be remembered that cleanliness plays a great part in successful poultry-keeping; on no account must filth be tolerated, or great mortality will ensue.

When the birds are a month old they should be taught to eat soft food, as they will then put on flesh more rapidly than when fed entirely on grain.

The order of meals from four to eight weeks should be as follows, the hours varying slightly according to season:—

7·0 a.m.	A little groats or canary seed put down overnight.
8·30 „	A warm meal mixed crumbly (either 14, 15, or 16).
10·30 „	No. 13 mixture as given above.
11·30 „	Chopped green food.
1·0 p.m.	Cooked lean meat.
2·30 „	No. 13 mixture.
4·0 „	A warm meal mixed crumbly (either 14, 15, or 24).
5·30 „	No. 13 mixture.

From eight weeks onward to eighteen weeks (if kept for stock), or until put up for fattening, the birds may be given:—

14.—Scalded biscuit meal	1 part	Evening feed, groats.
„ bran	1 „	
Pea or bean meal	1 „	
Barley meal	1 „	
Buckwheat meal	1 „	

or

15.—Scalded bran	2 parts	Evening meal, cracked wheat.
Barley meal	2 „	
Scalded sharps	1 part	

or

16.—Scalded bran	2 parts	Evening, dari or cracked maize.
Oatmeal	1 part	
Scalded sharps	1 „	

In each case they should be fed on this soft food three times daily, and they should still have one meal a day of cooked lean meat, and as much green food as they will eat. If kept for stock they may be

fed from eighteen weeks until they begin to lay on any of the above foods, but need only be given two soft feeds daily instead of three as heretofore.

Whole wheat, oats, barley, or maize should not be given to young birds until they are at least twelve weeks old. No mention of cooked rice has as yet been made, for the reason that birds brought up as here advised very rarely show signs of diarrhœa, or scour, as it is sometimes called. If, however, it be very cold, or there be a sudden change of weather, scour will sometimes attack the birds. It can nearly always be stopped by putting camphor in their drinking water, and by giving them one meal of well-boiled rice strained as dry as possible. If the "scour" still continues, give them, after an interval of 48 hours, a second meal of boiled rice, to which add two drops of chlorodyne for every sick bird; but be sure that it is very evenly mixed.

A good tonic for use during cold, raw weather is a mixture compounded of half a fluid ounce of sulphuric acid and half a pound of green copperas, dissolved in one gallon of hot water. The dose for chicks is one tablespoonful of the mixture to every gallon of drinking water, and double that amount to grown fowls, ducks, geese, or turkeys, but it should not be given more frequently than twice a week.

It should be kept in glass or stone jars, and labelled "Poison."

Ducks and Geese.

These, it must be remembered, are water-fowl, and should therefore be fed very largely on soft food. If hard corn be given them it should only be fed as a mid-day meal, and should be put in the birds' water troughs, together with a plentiful allowance of grit or gravel.

If water-birds are fed entirely on hard corn they will not do themselves justice as layers.

If ducklings get leg weakness it means that their food is too highly concentrated, and they should be given food largely composed of bran, green food (especially chopped cabbage), and a large amount of grit and cooked meat. Sick birds should always be yarded and fed separately.

When symptoms of diarrhœa arise isolate the sick birds and feed sparingly on drier food, giving less green food and bran and more meat and grit.

If properly fed and cared for no one should lose more than 5 per cent. of ducklings or goslings from sickness.

Ducklings cannot stand direct sunshine, and must have plenty of shade to which they can retire at will. Until they are 10 weeks old they are no hardier than chicks, but after this they will stand

practically anything in the way of weather, and they revel in heavy rains and snow.

The best green foods for ducklings are onion tops, dandelion, chickweed, green clover, green rye, and green oats.

If hatched in March, or early April, and fed properly, young ducks will often begin to lay at five months old, but in this case they should be fed very largely on meat and bran, so as to hold them back as much as possible. This is to some extent a matter of breed and of feeding. In the winter, four or five ducks may run with a drake; in the summer, seven.

A duck may be bred from for four seasons.

Grown geese can usually keep themselves, except in so far as grit—of which they need a large supply—is concerned; but the young ones should be fed on the same lines as ducklings, as they will then be found to grow and put on flesh much more rapidly than is usually the case.

All water-birds require a great deal of green food, grit, and animal food of some sort.

Ducklings.

Do not begin to feed until the ducklings are 24 hours old, then for four days give the following mixture:—

17.—8 parts of well-scalded bran.
9 „ rough oatmeal.
1 part very coarse sand.

Four times daily.

From four to 21 days give as follows:—

18.—7 parts scalded bran.
7 „ rough oatmeal.
2 „ finely-chopped green food (if cabbage, it must be boiled).
2 „ maize meal.
1 part cooked lean meat or meat meal.
1 „ very coarse sand or fine grit.

Four times daily.

From three to six weeks give:—

19.—6 parts scalded bran.
5 „ maize meal.
5 „ rough oatmeal.
2 „ chopped green food.
1 part fine grit.
1 „ cooked lean meat or meat meal.

Four times daily.

When from six to eight weeks old those birds selected to be kept for stock should have one part of fine bone meal added to the

following mixture. For those set aside for marketing this is not necessary:—

20.—8 parts maize meal.
4 „ scalded bran.
4 „ rough oatmeal.
3 „ cooked meat.
1 part grit.

This should be given three times daily, in addition to green food, which, however, may now be reduced in quantity.

From eight to 10 weeks:—

21.—8 parts of maize meal.
4 „ rough oatmeal.
3 „ scalded bran.
3 „ cooked meat.
2 „ grit.

No green food. Three times daily.

Ducks.

For breeding birds, until they show signs of coming on to lay, and if allowed out to graze, feed as follows:—

22.—10 parts bran (if weather be very hot scald this).
4 „ oatmeal.
2 „ maize meal.
2 „ cooked meat.
2 „ grit.

Give twice a day, and add as much green food as they will eat, chopped clover being the best possible.

For laying birds:—

23.—4 parts of wheat bran.
4 „ maize meal.
4 „ oatmeal.
2 „ cooked meat.
2 „ finely-chopped cabbage, green rye, or green clover.
1 part boiled turnips or swedes.
2 parts grit.
1 part oyster shell.

Give morning and evening, and at mid-day put a meal of oats, barley, or wheat, mixed with grit, into their water troughs.

Turkeys.

These birds came originally from a hot climate, and are, therefore, apt to be very delicate in England when young, but if kept very dry, both over-head and under-foot, and out of reach of cold winds, they will usually be found to grow fast and do well.

They may be reared in the same way as chickens, but must be moved on to fresh land every day, for, like pheasants and other wild birds, tainted land affects them very soon and kills them very easily. Turkeys should never be reared two years in succession on the same ground.

Young turkeys when hatched do not seem to know how to feed themselves. It is wise to rear them with chicks for the first few weeks, until they learn how to look after themselves and to find their own food.

Fattening.

When chicks reach the age of 14 weeks they are, or should be, strong enough to be put up for fattening, but backward ones should be allowed another week or two at liberty before being shut up.

Fattening pens can be easily made out of ordinary packing cases from which the top and one side have been taken, or from ordinary hen coops. They should be put upon legs not less than two feet high, and the bottoms of the coops or boxes should be made out of one-and-a-half-inch slats (slating lathes do excellently) nailed across so as to allow about two inches between the slats.

The bottom will then appear as in Fig. 1.

The front of the pen will be similar to that of an ordinary hen coop, and should have a hinged door or sliding opening, so that birds may be easily put in or taken out.

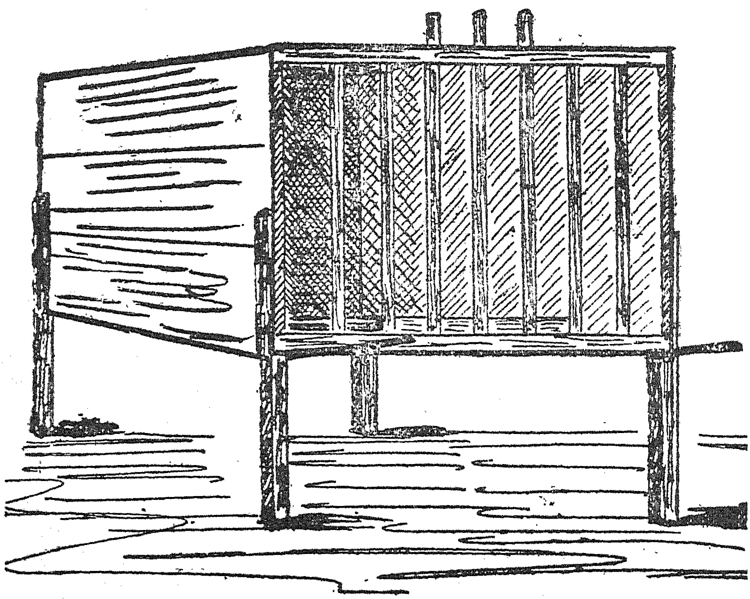


FIG. 1.

Not more than six birds should be put in one coop, and there should be only just room for them to feed comfortably.

The coop will appear as in Fig. 2.

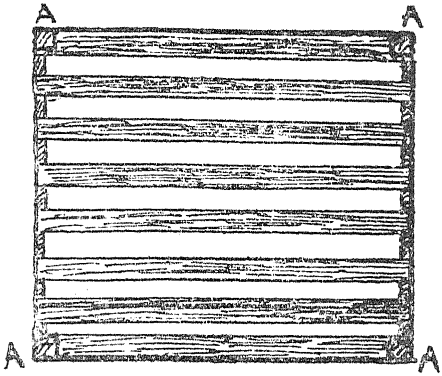


FIG. 2.

The birds should be placed in a coop at night, being first given a good meal and some drinking water. They should not be fed again for thirty-six hours, as it is well to allow their crops to become quite empty before they be fed in their new quarters.

Unless so starved the birds, especially if taken from a large flock, are apt to pine and to seriously lose condition.

For the first day or two they must be given just a little green food, but this must soon be discontinued.

Unless the coop can be placed in a shed a sack should be hung in front of it at night to prevent the birds catching cold ; this should also be done between meals, as exclusion of light induces sleep, and the birds consequently lay on flesh more quickly.

The space underneath the coop should be thickly covered with ashes, and all droppings should be raked out and taken away twice a day. The utmost cleanliness must be observed, or birds will lose rather than gain in condition and weight.

Two pieces of wood should be nailed to the outside of the bottom of the coop to project slightly upwards. On these a wooden trough may be placed at meal times, but it should be taken away directly the birds have finished feeding, and after removing any food which may have been left, it should be rinsed out with cold water.

Twice a week this trough should be thoroughly scoured out with boiling water and a hard brush.

The foods given to birds while undergoing the process of fattening should be fed in a liquid state, like thick soup, and a little grit may be added with advantage.

If the birds appear to dislike their food give them a change, for on no account must they be permitted to go off their feed. As a rule, however, any one of the mixtures here given may be fed every day.

The best materials to use for the purpose are barley meal, buckwheat meal, oatmeal, or Sussex ground oats, fine wheat meal, and boiled and mashed potatoes. No hard grain whatever should be given, nor is any drinking water necessary.

Whichever of the following mixtures is given, the foods composing it should be boiled in skim milk, and a little fresh, rough fat should be melted down and stirred into the mixture while both are hot.

24.—3 parts oatmeal or Sussex ground oats.
1 part maize meal.
1 „ fine wheat meal (not flour).

25.—2 parts Sussex ground oats.
2 „ barley meal.
1 part mashed potatoes.

26.—2 parts oatmeal or Sussex ground oats.
1 part maize meal.
2 parts fine wheat meal (not flour).

27.—2 parts buckwheat meal.
2 „ maize meal.
1 part barley meal.

28.—2 parts oatmeal.
1 part maize meal.
1 „ buckwheat meal.
1 „ mashed potatoes.

29.—1 part (sifted) barley meal.
3 parts oatmeal.
2 „ maize meal.

The combination of fat and milk will very greatly improve the quality of the meat.

The quantity required will be from 4 to 5½ozs. of food per bird per day divided into three equal portions.

Pea meal is not good at this period, as it is rather apt to harden the meat.

Birds should not be penned for longer than three weeks, but the exact number of days varies a great deal, as no two birds put on weight at the same rate; usually from 14 to 17 days will be found sufficient. Some experience is necessary to determine the proper time to kill a bird, and this can only be learned by practice.

No birds should be penned for fattening unless they are in good condition, as the method of feeding is undoubtedly a great strain on the birds' constitutions.

Ducks, geese, and turkeys cannot be shut up in the manner above described.

Both ducks and geese should be penned in small runs off the grass, and fed as advised earlier in this article. If their food be mixed with milk for the last two weeks their flesh will become whiter. For the first day or two they may be given a small quantity of well-boiled cabbage, chopped fine, once a day, but they must not be allowed water. A plentiful supply of grit must be given them or they will become ill.

Turkeys should, for their last six weeks, be housed in large, light, airy buildings, and only allowed out from 11·30 to 1 p.m. each day. For the last 10 days they should not leave their houses at all.

Their food may be the same as that given to the penned chickens.

A useful house for turkeys can be made as follows:—

Take five strong posts, each 3in. by 2in., three of which are 7½ft. and two 6½ft. long. Drive these into the ground so that the three in front stand up 6ft. from the ground and those at the back 5ft. (Two of those in front should be only 2ft. apart, one being for the door to fasten against.) To the tops of these nail strong cross-pieces; on these lay thatched hurdles and fasten them securely.

The sides may be made of wire netting of a wide mesh—3-in. will do—but the north and east sides should be covered with straw or sacking, as the turkeys must be kept fairly warm. The perches should be flat, very strong, and not less than 2ft. apart. The door may be of wire netting on a stout frame about 5ft. high by 2ft. wide.

Four turkeys may be kept in a house 6ft. square.

All birds should be starved for thirty-six hours before being killed so that the crop and intestines may become empty. Unless this is done the carcases will not keep for any length of time.

No weight whatever will be lost by this short period of starvation.

4, Whitehall Place, London, S.W.,
June, 1904.

CO-OPERATIVE WINERIES.

By A. DESPEISSIS.

Some ten years ago I published, on the then burning question of Central Wineries,* a few notes, from which I cull some remarks which have since proved to be correct:—

"Wine-making," I then said, "is in its infancy in this country; sooner or later it is bound to take rank amongst the leading colonial industries; now, however, it may be said to have reached the turning point in the history of its evolution, and it rests with the growers of this colony to decide whether, profiting by the experience of the other provinces of Australia, they will raise it from the start to the position it should occupy, or whether they will allow it to fall into a groove where it will simply vegetate until they will be compelled to help it out of it, regretting opportunities and time wasted."

Some of the leading vinegrowers at the time were prepared and even anxious to help in the formation of a central winery, provided that their interests were in some measure safeguarded; but the project never was considered by the Government with the attention it deserved.

State assistance was spasmodically promised, but never seriously entertained. The industry was allowed to drift along and steer the easiest course it could. Wine was scarce and sold readily; the question of the establishment of co-operative wineries was not pressed, except every now and again by some enterprising commercial agent, who tried to induce the Government to assist in establishing a profitable monopoly.

The organisation of central wineries, which could have been easily effected ten years ago, is now more difficult to achieve.

According to official figures four-fifths of the wine made in the season 1902-1903 was from grapes grown by the wine-makers themselves, and only one-fifth was from grapes bought from growers who are not equipped for making wine.

These figures show that the problem which confronted the growers a few years ago has been partly solved through inaction in establishing central wineries, and that there are left only growers producing in the aggregate 30,000 to 40,000 gallons—the output of

* "Central Wineries": Handbook of Horticulture and Viticulture of Western Australia, 1st Edition, p. 232.

one or two large vineyards which have not yet provided casks and cellarage accommodation for the produce of their grapes.

It is not contended that that being so, little or nothing remains to be done. On the contrary, it is mainly by re-organisation, and possibly by co-operation, that the injury admittedly inflicted upon the Western Australian winegrowers by the advent of Federation will be mitigated.

How co-operation was brought about amongst winegrowers in Germany, Italy, France, and California, and with what amount of success, will be reviewed in the following notes.

AUSTRALIAN WINERIES "CAPITALISTIC" NOT "CO-OPERATIVE."

In Australia wineries are not of the "Co-operative" order, they are "Capitalistic."

Victoria, South Australia, and New South Wales afford examples of such.

From the growers' point of view or as regards the advantage the State might have expected to derive from their organisation, they cannot be said to have proved successful.

Lack of organisation amongst vinegrowers and keen trade competition have resulted in a reduction of the price paid for grapes to a point where its cultivation ceases to become remunerative, nor can most of these wineries claim to have achieved for themselves the financial success they aimed at striking. The cut-throat policy which directed their operations caused incalculable harm being inflicted to the rising industry. Wine too often tainted with the germs responsible for a state of unsoundness, or too young and not yet purged of the unwholesome substances which disappear with age, have been forced on an unsuspecting market with no permanent benefit not only to those who stooped to those practices, but to many other well-meaning and hard-struggling wine-makers.

Another obstacle in the way of a more rapid progress of the rising industry has been the utter disregard of both the State and Federal Governments to foster vine-growing by encouraging the conversion into sound brandies and wine spirit of much wine unfit for human consumption. The unnecessary obstacles placed in the way of distillers, the inadequate margin provided by law between excise and import duties on spirit, which by Federal enactment amounts to nearly 1s. per proof gallon, have diverted hundreds of thousands of gallons of undrinkable wine from the pot still, to which it should have been consigned, to the back shop of clumsy wine-fakers, and have been thence distributed indiscriminately, under misleading labels, at enticing prices, among unsuspecting consumers.

If, as competition becomes keener, wine made anyhow, left to look after itself, or worse still, faked up by unscrupulous manipu-

lators and retailed at a ridiculously low price, is allowed to be marketed, it is reasonable to expect that the wine industry will languish and that the public health will suffer.

To counteract that evil I know of no better medium than "centralisation." Which form is preferable: "Capitalistic centralisation," which creates monopoly and in the end starves the industry, or "co-operative centralisation," which enlists the assistance of each individual helper and ensures a more even distribution of the profits at every stage, from the grower, through the manufacturer, to the distributor? The answer is evident enough.

CO-OPERATIVE WINERY.

The question may well be asked: What constitutes a co-operative winery? It may be defined as an association of two or more persons who agree to work in common either their cellars, or their grapes, or their wine, or else grapes, wine, and cellar conjointly, with the view of participating in the profits of the transaction.

That participation, of course, is based upon the respective value assigned to the contribution from each co-operator. Hitherto, whenever the question of central wineries has been discussed either at public meetings or through the Press in our midst, little or no practical suggestion has been formulated which would prove workable and satisfactory to the growers, to the manufacturers, or to the State whose assistance was sought. The State has been asked to put up substantial buildings and provide a suitable plant and material. Were this done the whole edifice sooner or later would collapse.

Returns furnished by the Registrar General show that the great majority of our winemakers already have some kind of cellars, vessels, and wine-making appliances. If the Government were to be induced to put up a costly cellar and furnish it, the question might be asked: Would it be utilised by the growers? What would become of all the plant already in existence? Should these cellars be closed and the casks and machinery, which have cost much money, be sold at a great sacrifice? Would it not, on the other hand, be wiser and more practical to arrange to use, for a time at all events, the cellars and plant of the shareholders, or whatever portion of it may be used, without, for the matter of that, overlooking, in the articles of association, the expediency of the company constructing, whenever thought desirable, a specially designed building, or of purchasing supplementary working plant for buildings already in existence?

Such co-operative wineries, which would merely pool their wines together so as to market them on better terms, without at the same time exercising a thorough control over the output, fail in several respects to fulfil the object of co-operative wineries; while they

exert no influence in directing the planting of a better selection of grapes and in insuring better methods of cultivation and of wine-making, they are wasteful in this much, that they effect no economy of working, they leave unutilised the by-products of wine-making—tartar, spirit, vinegar—and they usurp the legitimate functions of the distributing trade.

AIMS AND OBJECTS OF WINE-MAKING.

It matters little what the status of the vinegrower is, whether he works alone the salvation of his private undertaking, or whether he co-operates with others, all banded together towards the same end, his objects are:—

(1.) To make as good wine as possible.

(2.) To reduce, as far as practicable, the cost price of that wine.

(3.) To find the best market for that wine.

The question then narrows itself into one of knowing whether by individual efforts or by means of co-operation these objects are best fulfilled.

No doubt some few individual vinegrowers are met with who embody all the accomplishments of good cultivators, skilful manufacturers and enterprising merchants, but these natural gifts are not commonly found represented in many individuals, and as the shortcomings of any one of these are generally detrimental to the success of the others, it therefore follows that co-operation reduces risks.

How many wine-makers have any definite knowledge of the intimate composition of the raw material they work upon? They know that wine is the produce of the fermented juice of the grapes, but apart from routine methods which direct their operations, they have, concerning the changeable composition of the constituents of the grapes, of the changes which set in during fermentation, of the desirableness of fining, filtering, pasteurising wines, somewhat hazy ideas. Should anything unexpected turn up, these ideas thicken, and must weigh them with a sense of heavy responsibility unless they are endowed with a reckless temperament.

Co-operation, by employing skilful professionals, should transform into a sound business proposition what might prove a risky undertaking.

In the course of conversation with shrewd vineyard proprietors during my travels through the South of France last year I had often occasion to refer to wine-making as a promising Australian industry. I am aware that I created a considerable amount of amazement when I stated that the great majority of our wine-makers are men without any previous technical training in that

particular direction, and that they had not only to learn their experience but also, while operating on small amounts of grapes, they had, before even picking their first crop, to provide a kind of cellar, sufficient vats and casks for the wine, as well as a press and pump, and they had on that account placed on their shoulders a weight that is proving somewhat heavy for a great many and deters many more from embarking in the industry. In fact on almost every individual vineyard we found a kind of cellar. How many enterprising vinegrowers would have been much better off had they been spared that expense, and had they been relieved, when it was still in the fresh fruit, of much sound grape juice which has since been converted into wines unsuited for the market?

OBSTACLES IN THE WAY OF CO-OPERATIVE WINERIES.

Two main obstacles have in the past stood in the way of the establishment of central wineries on the co-operative system. One is a natural reluctance on the part of some wine-growers to join in with others on account of the very superior ideas they entertain about the quality of their own grapes, their own wine, or their own methods of manufacture. The idea that their own industry, their technical knowledge, or the favoured natural advantages which surround their particular vineyards should go on a par with others' crude ideas or methods is not one that appeals to them. Fortunately this human form of distrust and conceit is one which an equitable mode of organisation and a certainty of good management can easily dissipate.

A systematic and equitable classification and valuation of the grapes, grape-juice, or of the shareholder's wine is also one which presents some difficulties. Another obstacle, however, which is much more difficult to remove, is one of the financial order. Where there is a will, however, there is often a way; and it is not unlikely that the difficulties which confront each individual case may, on careful examination, be satisfactorily arranged.

I hardly expect that the idea of co-operative wineries will be from the start taken up by every wine-grower concerned. Provided, however, that some guarantee be offered by the State or some other organisation against losses supervening through the organisation of the wineries themselves, it is reasonable to expect that the movement will soon be started in a tentative kind of way. To try to net every wine-grower into the meshes of one organisation will probably prove much more difficult than it would seem.

On the other hand, by means of special encouragement, there is no reason why groups of wine-growers, linked more or less together by means of mutual trust or common interests, should not bring their vineyards or their cellars or both into small co-operative wineries. They will be beset by many difficulties at the start, but being few, and owing to a mutual understanding, they will more

readily, among themselves, solve these difficulties. They should be satisfied with small beginnings, and avoid making a big splash at the start. When successful applications will come in from others to join in the venture; but it would be inadvisable to press adherents.

There is nothing derogatory in the individual grower applying his energies in the direction followed by those working alongside of him—in following the advice of a committee of management with regard to the cultivation of the vineyard, the treatment of the vines, the proper period of picking; neither is there anything belittling in having one's wine properly made, blended with the neighbours' wines, and in delegating the sale of the whole to the co-operative association.

(To be continued.)

POULTRY NOTES.

By FRANK H. ROBERTSON.

THE EXPORT TRADE.

Western Australia, as everyone knows, is not an exporter of poultry products, but, unfortunately, cannot supply her own local requirements, therefore is a very large importer of eggs, and at certain seasons of the year of frozen dressed fowls, turkeys, and ducks; but the day must come when local production will force the imported article from the market. How many years must elapse before such occurs is hard to say. Most of the Eastern States, also New Zealand have a surplus for export, and have opened up a large trade in frozen poultry with South Africa; they also send to England and Western Australia. This State is geographically better situated than any of our Eastern neighbours, therefore, looking at the poultry industry from this point of view, it will be at once recognised that there is no limit to the expansion of poultry-raising. We are now a large grain-producing State, and one of the problems of the near future will be to find a profitable outlet for our surplus wheat, and by feeding it to poultry in preference to selling, will be found to pay much better than accepting prices which leave a very small percentage over cost of production. Some farmers are too much inclined to ignore poultry-raising altogether, or to look upon it as too small an affair. The present good market may be recognised, but the remark is made that it will soon be over-supplied. This I very much doubt. But even supposing such to be the case, the over-sea markets must always be kept in view, and again the demand is increasing all the world over. Poultry, as a more general article of diet. This increasing consump-

tion is brought about by the changed conditions of life that are everywhere to be seen. Nowadays we live at a greater speed, and the introduction of so much machinery in every phase of commerce reduces the amount of hard manual labour, hence the demand for light foods such as eggs and poultry. This has developed to an extraordinary degree in the United States of America. The Yankee rushes and hustles along all his life at express speed, he eats quickly, and wants food that is nourishing and will digest quickly. This is supplied by chickens, the trade in which has now assumed gigantic dimensions and is still growing. The toothsome broiler, that is a 2lb. or 3lb. chicken, has become a regular article of diet, and gives the bustling American exactly the class of food he requires. The demand for such tender food in this State is very small indeed. Here we want them double the size and double the age, but as time goes on quality will be more appreciated. The hustling spirit is gradually fermenting all quarters of the globe, and as a natural sequence follows the demand for lighter foods. These facts are well worth bearing in mind by those who are sceptical as to the value of poultry as a commercial commodity.

A few facts and figures relating to the export trade will be of interest. The value of the imports of eggs into England for 1903 was £6,617,619, and poultry £1,203,086, making a total importation of poultry products of nearly eight millions for the 12 months. Russia and Denmark are the two foreign countries which send the largest number of eggs to England. The total consumption of eggs and fowls in Great Britain for 1903 was valued at £17,420,705, divided as follows:—Imported, £7,820,705; Irish, £2,300,000; British, £7,300,000. The demand for the English and South African markets is—Chickens (14 to 18 weeks old and weighing 3lb. to 4½lbs.), good, well-fattened birds fetch about 10d. per lb., but cockerels showing spur and blueish-coloured flesh fetch poor prices. A plump, white-fleshed fowl is what is wanted. The demand for this class is great. Ducks should be from 10 to 13 weeks old, and weigh 4lbs. to 4½lbs.; turkey gobblers, 12lbs. to 20lbs.; hens, 7lbs. to 10lbs., the preference being for the heavy weights. Geese should not be sent at all. To produce the desired quality all stock should be specially topped off and fattened, and for this purpose if the meal is mixed with milk it will be found a great advantage—and fed three times a day for a fortnight. The best prices in the London market are obtainable during the months of February, March, April, and May, but turkeys fetch the best prices at Christmas time. These months fit in very well with our breeding seasons. The early-hatched chickens of June, July, and August come in well for our local market, and the later ones for the home trade.

The exporting of eggs, stored in cool storage chambers, will also, no doubt, some day become a valuable industry.

SPECIAL PRODUCTS OF THE FARM.

Compiled by the EDITOR.

I have headed this chapter the "Special Products of the Farm" to distinguish the crops enumerated and briefly described from the staple hay and grain crops of most of our farms. By-products would, perhaps, have been a more suitable expression, as many of the products mentioned could only be grown profitably under certain conditions which do not exist in this colony at the present time. There are, however, many of our farmers who have a decided experimental turn, and it is always desirable to encourage experimentation with new products and advocate diversified farming so long as it can be conducted with profit. The ideal farm is that in which the maximum variety of crops is produced and the minimum purchased. The tendency in Australia is to produce one staple crop and buy everything else. The farmer will, in spite of all advice to the contrary, and with reason on his side, follow the lines of least resistance in his practice, and when labour is dear the line of least resistance often means the line of greatest profit. The following notes will, I hope, be found of use to those who have a desire to diversify the products of their holdings, and in doing so add materially to the comfort as well as the profits of rural existence and enterprise.

TURNIPS AND SWEDES.—It may be said that the turnip is cultivated as a culinary vegetable at certain seasons of the year from one end to the other in this colony, but its cultivation as a field crop is very limited, being confined to a few farms in the eastern and south-western districts. It is a question that only the farmer himself can decide whether it is profitable to grow these root crops, and though the turnip is a staple crop in Great Britain, it is a moot point whether more nutritive crops cannot be grown here serving the same purpose with much less labour, and, consequently, more profit. Turnips and swedes are cultivated only with the greatest success where the rainfall is plentiful. They are valuable crops for a rotation, their deep-working proclivities bringing to the surface plant-food that would otherwise be out of the reach of the shallower rooting crops. There are numerous varieties of field turnips and swedes, chief of which are purple tops, yellow mammoth, elephant, green top, white globe, and others. The soils best adapted to turnips are light loams, loose and open, and these must be deeply cultivated and thoroughly pulverised. Light soils on a retentive bottom, or clay soils, are unsuitable to this crop. The soil should be enriched by a liberal dressing of manure rich in phosphates, such as bone-dust, guano, or superphosphates. Nitrogenous manures will cause the plants to run to top. Turnips may be sown broadcast or drilled

in, the latter being preferable, as permitting subsequent cultivation more freely. From two to five pounds of seed is sufficient to sow an acre, and the plants will have to be thinned out to about six inches apart. Frequent hoeings are necessary to perfect growth. Turnips may be fed on the ground or carted off and fed chopped with hay or other fodder. From 75 to 100 pounds of turnips per day, with hay, is reckoned a ration for an animal weighing 1,000 pounds.

KOHL RABI is a hybrid turnip or turnip-stemmed cabbage. This plant can be grown successfully when turnips cannot, and is not so subject to the fly and other diseases. The seed may be sown broadcast or in drills, and subsequent cultivation should be the same as for cabbages. The tops are as good as cabbage for table use, and the bulbs, when young, are preferable to turnips as a vegetable.

MANGOLD WURZEL.—This is an excellent root crop, both for stock and in rotation for improving the ground. Mangolds may be grown on salty ground, and when the crop is removed a good deal of the salt is removed with them, and the ground is thus gradually sweetened by successive crops. The mangold requires a plenteous rainfall and does best in deep, rich, well-cultivated and heavily-manured soils; though in the matter of soils it is more accommodating than the turnip. Three or four pounds per acre sown in drills and covered to a depth of about an inch is sufficient. It is usual to steep the seed in water for twenty-four hours before sowing. The after cultivation consists in thinning out, and in the free use of the horse hoe, so as to keep the ground moist and the surface free from weeds. Mangolds should be thinned out to a foot apart in the rows, the rows being not less than double this distance apart. In harvesting care should be taken not to bruise or injure the root, otherwise decay sets in very rapidly and spreads to the whole heap.

CARROTS.—The carrot, as a field crop, may be said to be almost unknown in Western Australia, but no root is more appreciated by stock of all kinds, and, weight for weight, it is only slightly less nutritive than the potato, while the average yield per acre is far greater. Horses are particularly fond of carrots, and they should always form a part of their diet if perfect condition is desired. A carrot ration keeps up the milk of cows, and undoubtedly adds a richer flavour and a higher colour to the butter. "As clean as a carrot bed" is an old saying. The carrot requires much more attention and hand labour than any other root crop, and is consequently a more expensive plant to grow. The young plants must be kept absolutely free from weeds if a maximum crop is desired. If thoroughly rotten dung cannot be procured it is better to use artificial manure, but none of a very stimulating nature should be applied. Land enriched by previous high culture is in all cases the best for this crop, as larger roots free from forks and useless appendages will be secured. Plenteous rainfall and a mild climate suits the carrot best, and the cultivation must be deep and fine. It

is most productive in deep, light, warm loams overlaying a deep and pervious subsoil. The seed, which germinates slowly and irregularly, should be fresh, and is often soaked for a few hours before sowing. From two to five pounds of seed per acre is required, according to the quality, and the covering must be very light. Thinning after the plants are fit to handle, and thorough subsequent cultivation, are essential to a maximum crop of carrots. The tops may be fed to stock, and the roots raised by fork or ploughed out and stored for future use.

PARSNIPS.—The parsnip is, if anything, a more valuable root crop than the carrot. It is, in the first place, easier of cultivation, and possesses greater nutritive qualities. It is invaluable as a food for dairy cattle, and is for this purpose extensively cultivated in Jersey islands. It gives a peculiarly rich, high flavour to butter, and adds to its firmness. There are two varieties of parsnips, the round and the long, the latter being most generally cultivated both as a garden and a field crop. A mild and moist climate is essential to a maximum crop of this root, though it is surprising how well it thrives under most trying conditions. It likes a deep friable loam like the carrot and other root crops, and needs similar subsequent cultivation after the young plants are through the ground.

JERUSALEM ARTICHOKES.—This is an edible tuber, nearly as nutritious as the potato, which is almost ignored in this colony. The stalks are almost as valuable as the tubers, and its cultivation is deserving of every encouragement. It grows as well on light soils as it does on tenacious clays, and thrives where no other root crop would exist. It is not exhaustive to the soil, and it may be harvested in such a manner that the work of harvesting is at the same time the work of reseeding. It will endure the extremes of heat and cold, and furnish an abundance of fattening fodder when all else has failed. The tubers should be planted in early fall or in the spring in the same way as potatoes, and the better the ground and the more attention the plants get, it is needless to say, the better will be the crop. The tubers, which make an excellent table vegetable, may be either forked or ploughed out, or the ground may be fenced off and the pigs turned in. In France, where this crop is cultivated largely, the stakes are either cut and used as green feed, or stacked and made into fodder like maize.

INDIAN CORN.—This may be cultivated either for green or dry fodder or ensilage or for the grain. If for the former, some quick-growing variety should be selected and the seed sown thickly broadcast. If for grain, the seed is sown in hills at equal distances apart so as to prevent subsequent cultivation. Light and porous loams, a little on the sandy side, are the best soils for maize if well tilled, but the crops will do well on all soils, except the stiffest clays, if the land is either naturally rich or artificially made so. Maize is a gross feeder and requires plenty of nutriment, which it absorbs very rapidly. On light soils there is no better fertiliser than well-rolled stable manure, but this is not always available and artificial

fertilisers have to be resorted to. The manures should in all cases be broadcasted over the land, as the maize plant, during the period of its growth, sends out a great number of lateral surface roots in search of food. Thorough tillage is essential to a heavy maize crop. In sowing for grain the land should be deeply ploughed and then harrowed, and marked off into rows and cross rows three feet apart. At the intersections three or four seeds are planted and well covered, about half to two inches deep. There are numerous machines made for planting which do the work expeditiously and save time and labour where a large area has to be sown. The sowing should not take place until spring, when danger of severe frost is over. The first hoeing should be given when the thinning out is done—that is, when the plants are about two inches high, and easily handled. Subsequent cultivation should be as frequent as possible, especially in the drier districts, so as to retain as much moisture in the soil as possible. Cultivation should not be too deep, otherwise the chief feeding roots of the plants will be destroyed. With a view to securing the best seed for next season, while the crop is still standing in the field, just before the gathering, the farmer should select and mark the earliest ripened and best-formed ears, so that they may be distinguished at harvesting and put on one side for seed. The crop should be harvested either by cutting the tops when the tassel begins to grow dry, using the tops for fodder, or cutting the plant altogether when the stalk has begun to ripen. The stalks should be tied in bundles and stooked, and when dry removed to the barn. The husking and shelling may be done as required and when the most favourable opportunity presents itself. There are many varieties of maize in the market, and seed should be selected to suit the district in the matter of ripening. For green fodder Cobbets' corn or ninety day is the best perhaps.

BUCKWHEAT.—Flour made from the grain of this plant is universally used in the United States for cakes and in general cookery. The plant itself is chiefly useful as a catch crop for growing on poor soils, and ploughing in as green manure. The plant does best on light soils and requires a moderate amount of moisture. As a green manure it is less valuable than the clovers, but will grow where these plants will not. The seed may be sown on ploughed ground in the spring, and lightly harrowed in, from three pecks to a bushel (fifty pounds) being ample. The Japanese is the most prolific and earliest variety, yielding from thirty to forty bushels per acre. The grain is excellent feed for poultry.

FIELD PEAS.—Leguminous plants such as peas and beans play a most important part in agronomic economy. Their exact functions and value are fully explained in the part of the GUIDE devoted to manures and manuring, and need not be dilated upon here, where it is sufficient to say that they add nitrogen to the soil, the most valuable and the most expensive constituent to supply by artificial means, and should find a place in the rotation of every farm where it is possible to grow them. There are several varieties of field pea on the market, those in most general use being the dun and

the blue kinds. A stiffish loam is the soil the pea likes best, but it will thrive on almost any class of soil, stiff clay excepted, if well cultivated and provided with an adequate amount of moisture and nutriment. An ordinary ploughing is sufficient preparation prior to sowing the seed, at the rate of from two to three bushels per acre. The harrow and roller should follow. It is a good plan to sow a few oats with the peas if they are to be harvested and not ploughed in, as the oat stalks keep them upright and in a better position for reaping. If left to get nearly ripe the pea vines may be harvested with a horse rake. It is not necessary to say that pea vines are a most nutritive fodder for all classes of stock, almost as nutritive as the pulse. The fodder may be fed just as it is, or the pulse may be first threshed out. Pigs should be turned on the stubble to glean whatever peas have been knocked out in harvesting, and will fatten rapidly. Peas may be sown in the south-west at any time of the year, and in the drier districts in June and July.

VETCHES OR TARES.—This is another leguminous plant, valuable as a soil restorer, and also for fodder. Barley tares, peas, and rape make an excellent mixture for the silo. Tares are usually sown with the cereal crops at the rate of from ½ to 1½ bushels per acre. The crops should be cut green or ploughed in, as the land is soon apt to get foul. Green tares are excellent food for milch cows.

BEANS.—This is a most important leguminous crop in the northern hemisphere, but very little grown in Australia. Beans grow well in a variety of soils, and there is no reason why the crop should not enter more largely than it does into the rural economy of the farmers of the southern hemisphere. A thorough ploughing is the only preliminary preparation required for the crop, unless manure has to be added to the soil. The seed should be sown thickly in drills three feet apart, the seeds four or five inches apart in the rows; from 2⅓ to 3 bushels (60 pounds) will give an acre of tick beans. Subsequent cultivation should consist in horse hoeing and keeping the ground free from weeds, and the surface well broken up. When the leaves begin to shrivel and the pods to turn, the crop should be harvested by pulling up the plants and stacking them in some convenient spot on rails laid on the ground. They will soon become dry enough for threshing out. The seed, unless thoroughly dry, heats rapidly, consequently beans should not be kept in sacks until all the superfluous moisture has evaporated from them. The stalks are of value as a fodder for sheep and horses, and add much to the richness of the manure pile.

TEOSINTE (*Euchlæna Mexicana*).—A fodder plant, native of Southern Mexico and Guatemala, introduced into Australia by the late Baron von Müeller. "The young shoots when boiled constitute a fair culinary esculent." This plant is described as being much quicker in growth than guinea grass, and rather slower than maize, but lasting longer as green fodder. It is not so hardy as sorghum. The teosinte is said to yield an immense crop, one seed producing from 40 to 60 stalks, and growing to a height of 12 and 18 feet under

favourable conditions. One pound of seed will sow an acre. Treatment as for the sorghums.

EARLY AMBER CANE.—This is a useful and valuable fodder plant, a variety of sorghum, but care must be exercised in feeding it to stock, as cases are on record of cattle having succumbed by having been allowed to eat it before it was fully matured. A check in its growth renders it bitter and unpalatable, and it should only be grown where uninterrupted progress is assured. It may be fed green, or made into ensilage, preferably the latter; if the former, it must not be used until the seed has shot out. The seed should be sown in drills three feet apart or broadcast in the spring. When drilled in subsequent surface cultivation is advisable as fostering growth and early maturity. Six to twelve pounds, according to method of sowing, drill or broadcast, will sow an acre.

DHOURA, OR EGYPTIAN CORN, WHITE SEEDED.—This is a non-saccharine variety of sorghum, producing a great yield of grain. It stands drought well, and grows from six to twelve feet high, and may be repeatedly cut for green fodder. All kinds of stock are exceedingly fond of it. The seed is excellent food for chickens. Twenty pounds broadcast, or fourteen pounds in drills, are required to sow an acre. Drills should be three feet apart, and the plants thinned out to a foot or eighteen inches, according to the prodigality of growth. Subsequent cultivation as for other sorghums.

KAFFIR BRANCHING CORN.—Another non-saccharine variety of sorghum, of low stocky habit. It does not stool from the root, but branches from the top joints. The whole stalk, as well as the blades, cures into excellent fodder, and in all stages is available for green feed. Withstands drought well, and is said to succeed on land too poor to grow anything else. Sow from September to January. Six pounds required to sow an acre in drills, and ten to twelve pounds broadcast. Subsequent cultivation as for other varieties of sorghum.

JOHNSON GRASS, OR EVERGREEN MILLET (*Sorghum halapense*).—A variety of sorghum which has of late years come into use. It thrives well in almost all soils and situations, however warm and dry, but where it can be irrigated it produces enormous crops. Cattle, horses, and pigs are fond of it when young. The seed takes a long time to germinate. Fourteen pounds required to sow an acre broadcast. This plant should only be produced on waste corners, as it is exceedingly difficult to eradicate once it has taken hold. Pigs do well on the roots, which, under favourable conditions, attain the thickness and have the appearance of a bamboo. As a fodder this plant is somewhat overrated, and is best avoided except on land that would otherwise be waste.

JERUSALEM CORN.—This variety of sorghum belongs to the non-saccharine class. It grows about three feet high, makes one large head on main stalk, and several smaller heads on side shoots—often as many as eight heads on one stalk. The grains are pure

white and nearly flat, six pounds of seed being sufficient to plant an acre in drills. This is claimed—and, in the practical opinion of the writer, quite justly—to be one of the best and surest grain crops for dry countries and seasons. Drills three feet apart, and subsequent cultivation, as for other sorghums.

SAINFOIN, OR ESPARCETTE (*Hedysarum onobrychis*).—Cattle are very fond of sainfoin, whether in its green state or made into hay. It is especially valuable for dry climates, and yields two crops a year. Sainfoin is a perennial, grows upright, reaching a height of from two to three feet, and bearing a broad, flesh-coloured flower. If the crop is intended to stand for more than one season, the ground should be clean aud well worked. Twenty pounds (in the husk) required to sow an acre broadcast.

SORGHUM SACCHARATUM (*Syn. holcus*).—This is a valuable plant, in warm districts where the soil is good, for use as green fodder during summer, being similar to maize in that respect. It is found to be more fattening than milk-producing, and, therefore, better adapted for store than for dairy cattle. It also requires the same kind of culture as maize. Seed may be sown in September, and again in the course of the next two months for succession. It should be sown in drills three feet apart, put in thinly, as its habit is to tiller. The plants may be thinned for use as they progress, until the remainder stand a foot apart. Six pounds in drills, or 12 pounds broadcast, required to sow an acre.

GIANT SPURREY (*Spergula maxima*).—The spurrey is an annual plant which is largely grown in Russia for making hay. It is said that milch cows fed on it give superior milk and butter, and sheep excellent mutton. It grows well on poor, dry, sandy soil almost too poor to grow any other crop. The *Rural New Yorker* says "From four to six weeks after sowing it is in its best condition for pasture. The seed may be sown from September to December." Its value as a manurial plant on light soils is pronounced. It is readily eaten by cows and sheep. Fifteen pounds required to sow an acre.

(To be continued.)

MARKET REPORT.

Messrs. Dalgety and Co., Ltd., report as follows in connection with their sales of produce held at Perth and Fremantle for the month ended October 31st, 1904:—

Wheat.—Sales of Australian wheat are reported to have been effected in London at up to 35s. 6d. per quarter of 480lbs. c.i.f. Adelaide and Melbourne markets have been quieter at from 3s. 7d. to 3s. 9d. per bushel. With regard to local wheat, the market is now very strong. Stocks of wheat in the country are now considerably reduced, and there is a good buying inquiry, and much business is being transacted daily, several fair-sized parcels having changed hands during the week. Present rates are 3s. 3d. and 3s. 4d. per bushel f.o.r. York and Northam. Consignments of wheat to Perth and Fremantle have been very light. The market opened at 3s. 6d., and has gradually firmed to 3s. 7d., and to-day we have to report a strong inquiry at the latter price, and an improvement on this is even possible. There is practically a famine for wheat at Perth and Fremantle. During the week we sold in the country several parcels of wheat totalling 800 bags, in addition to which we sold about 200 bags at Fremantle and Perth. Holders of wheat might do well to take advantage of the present situation, and we invite correspondence from sellers.

Hay.—Business in this line is at a standstill. Stock-shippers are not in want of supplies, and beyond small orders very little hay has changed hands.

Algerian Oats.—Local oats are scarce. We could effect sales of specially prime samples at a considerable advance on ruling quotations. Supplies still continue to be drawn from Victoria, and Melbourne market is now much firmer at 1s. 4½d. to 1s. 5d. per bushel f.o.b., which is responsible for an advance of West Australian quotations.

Straw.—No consignments forward. We have an inquiry for a few trucks, price £2 per ton f.o.r. Perth and Fremantle. We placed about eight tons privately at this figure. Growers, however, would do well to allow us to arrange sales privately before consigning, as this line is only in limited demand.

Chaff.—There were 35 trucks of chaff forward on Monday, October 3, but on succeeding days the offerings have been much lighter. Country stocks of last season's chaff are now greatly reduced, and doubtless the country shows during the past week have somewhat interfered with consignments. We are advised from Northam that many orders for a number of small parcels have been placed for prompt delivery for the goldfields, which is at least an indication that consignments in that direction have been rather light during the week. All along prime chaff has been in good demand at Perth at full market rates. There has been less inferior chaff on the markets, which is satisfactory, and there is still a quantity of green feed round Perth and Fremantle; however, a few weeks of warm weather will doubtless spoil this class of feed, and then there should be a better demand for the lower grades of chaff. Buyers were well represented at all sales. We secured top price for the week with a truck of prime green

wheaten chaff from Pingelly (£4 7s. 6d. per ton); this was a splendid sample, and we also sold a truck of prime oaten chaff from the same district at £4 per ton. The market closes at the following rates:—Prime green wheaten chaff, extra quality, firm demand, at £4 5s. to £4 7s. 6d. per ton; prime green wheaten, good demand, at £4 to £4 2s. 6d. per ton; good quality wheaten, from £3 7s. 6d. per ton upwards; medium wheaten, from £2 15s. per ton upwards; inferior wheaten, from 30s. per ton upwards; prime oaten chaff, extra quality, £4 per ton; good quality oaten, dry, nominal value, £3 2s. 6d. to £3 7s. 6d. per ton. Supplies have been drawn for the past week from the following districts:—Oaten chaff, from Northam, Greenhills, and Pingelly; wheaten chaff, Newcastle, Northam, Beverley, York, and Pingelly districts, the best samples coming from Pingelly. Farmers are quite safe in consigning sound samples of prime chaff to market for some time ahead; but we would again remind growers that many a truck load of otherwise prime chaff is sold at a low value solely on account of the presence of one or two bags of discoloured chaff. During September, 1904, we estimate that the arrivals of chaff to Perth and Fremantle amounted to 1,882 tons, of which we handled 696 tons, or considerably more than one-third. These centres distributed and consumed approximately 1,967 tons, and the aggregate stocks of both centres on September 30 were 85 tons less than at the end of August. On the face of this it is difficult to understand that values should not be quite so high as ruling rates at the end of August, but we would explain that August rates were more than well maintained up till September 23, when after that date heavy consignments came on to the markets, thereby causing prices to ease. We estimate stocks at Perth and Fremantle on September 30 to have been 701 tons, very little of which is prime—a very light stock for such large centres as Perth and Fremantle—and a few days' light arrivals would very promptly have a firm effect on values for prime samples. It will not be a matter of any time now before new season's chaff will be available for consumption.

KALGOORLIE.

Chaff Report.—Arrivals during the past week have been very regular and prime chaff has been in short supply, although there have been considerable quantities of poor grades available. During the last couple of days supplies have been very scanty, and the demand has consequently been excellent. Closing prices are as follow:—Prime green wheaten, £5 5s. per ton (with very good demand); prime green wheaten, extra quality, worth £5 7s. 6d. per ton (none available); good quality wheaten, averaging £4 12s. 6d. to £4 15s. (fair sales); mixed and inferior grades, ranging from £3 10s. to £4 10s. per ton, according to quality.

STOCK AND STATION REPORT.

YORK.

We held our usual bi-monthly sale at York on Wednesday, September 28, when there was a full yarding of stock, and a fair attendance. Fat wethers sold at up to 24s. 6d.; hoggets at 18s. 6d.; a good line of store sheep at 20s.; store ewes, shorn, at 16s.; lambs, at 11s. 9d. The demand for pigs was quiet. Porkers sold at from 30s. to 46s.; slips, from 14s. to 16s. Cows, with calves at foot, at £9 15s. to £10 10s.; fat steers, £9 to £10. The demand f ordraught horses was somewhat quiet, but sales were effected at from £22 to £29. First-class draught horses sold at up to £45.

BEVERLEY.

At Beverley sale on Thursday, September 29, there was a full yarding of stock, and a good attendance of buyers. Ewes, with 45 per cent. lambs at foot, sold at £1; fat lambs, at 11s. 10d. As buyers' and sellers' idea of values differed so widely, no sales of fat sheep were effected. The pig market was somewhat dull, but sales were effected as follow:—Porkers, from 29s. to 32s. 6d.; forward slips, to 25s.; heavy bacon pigs, £3 10s. Milch cows sold at from £10 10s. to £12 10s.; springers, to £10; heifers, to £7 10s.; store steer, to £4 15s. Draught horses met with good demand, and several changed hands. Heavy draughts, from £32 to £45; medium draughts, from £16 10s. to £23. Several light horses changed hands at £3 to £11. Gobblers sold at £1 per pair. Ducks, 6s. 3d. to 6s. 4d. per pair. Fowls, from 5s. 3d. to 6s. per pair.

HIDES, SKINS, TALLOW, ETC.

Wool.—We are in receipt of the following cablegram from our London office, dated 3rd inst.:—"Wool market is very firm, and we expect a good demand for 'new clip wools' sixth series of sales in London." Our offerings to-day included a parcel from the goldfields and some small oddments of farmers' lots. We quote:—Merino fleece, medium quality, 7¾d. to 8¼d. per lb.; merino fleece, inferior quality, 6¾d. to 7½d., merino fleece, goldfields, 6½d. to 6¾d.; lambs, 6½d.; bellies and pieces, 3½d. to 4½d.

Sheepskins.—Average supplies to hand, but mostly of inferior quality, no super merino skins being offered, and we quote these nominally. Strong competition ruled throughout, values showing a slight improvement on last week's improved prices, crossbreds and lambs being in particularly keen request. Our London office wires us to-day as follows:—"Merino and fine crossbred sheepskins higher by par to ¼d.; medium and coarse crossbred higher by ¼d. to ½d." Super merino full-wool, to 7½d (nominal); good merino, three-quarter to full-wool, 6¾d. to 7¼d.; medium merino, three-quarter to full-wool, 6¼d. to 6¾d.; good merino, quarter to half-wool, 5¾d. to 6¼d.; medium, quarter to half-wool, 4¾d. to 5¼d; fine crossbred, three-quarter to full-wool, 6¾d. to 7¼d.; fine crossbred, half to full-wool, 5¼d. to 6¼d.; medium, three-quarter to full-wool, 6¼d. to 6¾d.; coarse, 5¾d. to 6d.; pelts, 3½d. to 4d.; lambs, 5d. to 5¾d. In all cases where pelts of above are sun-dried, weevil-eaten, torn, or perished prices are from 1d. to 2d. below quotations.

Hides.—Only moderate offerings, and we made a ready clearance, with no material alteration in values. Heavies, special (none forward), 4d. to 4½d.; medium and light, 4⅛d. to 4⅜d.; damaged and cut, 3½d. to 3¾d.; dry, to 4¾d.; ticky, to 3¾d.

Calfskins.—Sound and good conditioned, to 2s. 6d. each; cut and damaged, 1s. to 1s. 6d. each. Attention to flaying and preparation for market is very necessary, and results in enhanced values.

Tallow.—This market is animated, and prices are higher by 10s. per ton. Medium mixed, in casks, to 20s. per cwt.; inferior, 18s. to 19s. per cwt.; tins and oddments, 16s. to 18s. per cwt.

Kangaroo Skins.—We offered the usual assortment, and prices received admit of no alteration; ¾lb. to 1lb. average, blue skins 2s. 4d. to 2s. 7d., red skins 2s. to 2s. 5d.; ½lb. average, blue skins 1s. 4d. to 1s. 7d., red skins 1s. 3d. to 1s. 4d.; 1½lb. to 2lb. average, blue skins 1s. 10d. to 2s. 2d., red skins 1s. 9d. to 2s.; extra heavy weights, blue skins 1s. 2d. to 1s. 4d., red

skins 1s. 2d. to 1s. 4d.; damaged, blue skins 1s. to 1s. 8d., red skins 1s. to 1s. 7d.; brush kangaroo, blue skins 1s. to 1s. 3½d.; Euro skins, 1s. to 1s. 7d.

Opossum Skins.—None forward, and we quote these nominally:—Good greys and reds, 5s. 6d. to 5s. 9d. per dozen average; medium greys and reds, 4s. 3d. to 4s. 6d. do.; good blacks, 15s. to 18s. do.; inferior blacks, to 13s. 6d. do.

Horns, Hair, etc.—Horns, large and fresh, 30s. to 37s. per 100; small and fresh, to 10s. per 100; stale and perished, to 5s. per 100; very small, to 1s. per 100; rough bones, 3s. 6d. per cwt.; horsehair, 1s. per lb.; cowhair 5½d. per lb.

GARDEN NOTES FOR NOVEMBER.

By PERCY G. WICKEN.

This month, as a rule, ushers in our spell of dry weather for the summer, and sowing operations, except in the coastal districts, are very quiet, all plants previously sown should now be well forward, and the energies of the gardener should be turned in the direction of keeping the weeds in check and in keeping the ground well stirred so as to conserve all the moisture possible. Owing to the heavy fall of rain in September, the early sown spring vegetables should have made a good growth, and if the soil is kept in a fine state of tilth and the insect pests kept in check, the young plants can be kept growing even if no more rain falls.

Where it is necessary to manure any vegetables that are at all backwards or stunted, at this season of the year liquid manure should be used in preference to any other, as being soluble it is more readily available as plant food. A solution in the proportion of 1oz. of sulphate ammonia to one gallon of water will act as a stimulant to most plants, except those of the Leguminose order, which are more benefited by the application of a similar quantity of sulphate of potash and superphosphate. This liquid manure should be applied a few inches away from the stem of the plant, so that the young roots can reach out and absorb it and should not be allowed to touch the stem of the plant. In favoured localities where there are natural supplies of water, or where advantage has been taken of the excellent supply of water which runs to waste during the winter months, to conserve a supply for use in the dry weather, irrigation will be possible, and then it will be possible to keep up a supply of

vegetables all the year round, and planting may be continued during the month, where, however, water is not available, the planting out of fresh seeds is limited.

BEANS (French or Kidney).—Will continue to do well if there is sufficient moisture in the soil to germinate the seed, and a few more rows of this plant may be sown. They are greatly benefited by the application of a dressing of sulphate of potash and superphosphate, either in the form of liquid manure or dusted along the drills and raked in.

BEANS (Lima).—Should be largely sown this month; they stand the heat well. The dwarf varieties require to be sown the same as French beans, while the running varieties will require to be staked or tresselled. They are very prolific, and should be largely grown.

BEANS (Madagascar).—These beans are hardy and prolific, and well worth growing; they are great climbers, and bear their pods in clusters. They are called the "Poor man's bean," and are ornamental as well as edible.

BEET (Red).—Sow a little seed to keep up a supply; the Globe variety is best to sow at this time.

BEET (Silver).—Transplant all the young plants you have; the plant yields a large, succulent, green leaf, which makes an excellent vegetable in the summer.

CABBAGE.—If you have moist spots, or plenty of water, plant out a further supply of this plant; but, if no means of irrigating are available, it is of little use; if grubs are troublesome, spray with a mixture of Paris green and water, 1oz. to 10gals. of water; make the Paris green into a paste before adding the water, and stir well.

CARROTS.—A few rows may be sown to keep up a supply.

CELERY.—Those plants already up should be well earthed up so as to cause them to bleach. A little seed may be sown for future use.

CHOKO.—A few of these plants may be put out along a fence or trellis as they are good climbers; the whole fruit is planted and shoots out from the centre. It grows well in the hot weather.

CUCUMBER.—Those sown early should be now yielding cucumbers for market. In moist localities a few more seeds may be sown.

EGG PLANTS.—Young plants raised in seed beds may now be planted out. They require a well-manured soil.

MAIZE (Sweet).—If the ground is in a fine state of tilth, a good supply of this plant for culinary purposes should be sown.

The edible kinds are mostly dwarf varieties and may be planted in rows two feet apart and one foot apart in the drills.

MELONS AND PUMPKINS.—Keep the land well ploughed between the hills until the vines begin to run. In cooler localities a few more hills may be sown.

OKRAS.—Plants raised in a seed bed may be planted out in the open.

SWEET POTATOES.—Plenty of shoots from the tubers in the beds should now be available for planting out, and the sooner they are planted out the better. Plant in ridges three feet apart and one foot apart in the ridge.

TOMATOES.—Plant out extensively of this wholesome plant. From the warmer districts some of the early fruit should be in the market. There is always a good demand for this fruit at a good price, and those having a garden should plant out all the seedlings they can obtain. Plant in drills three feet apart and two feet in the drills, and manure well. As they make a good growth, they should be tied up to stakes and the lower branches kept off the ground.

FARM.—The hay harvest will now be in full swing in the Eastern districts, while in some of the more forward parts it will be over. Given fine weather at this time the harvest promises to be a good one, and settlers will do well not to cut for hay any crops that promise to give a good yield of grain, as the demand for hay or chaff is limited, and the prospects of an outside market for this class of fodder is very slight, whereas a surplus of wheat can always be exported and the market price obtained. Those who have not taken the precaution to plough a fire-break round their paddocks should do so at once, as it is too late to do it when the fire breaks out; and although a small fire-break may not altogether stop a fire, it still affords great help to those employed in beating it out, and the temporary check may help the beaters to get the fire under, and thereby save considerable damage being done, to say nothing of the loss of grass, and possibly having all the feed for stock burnt. The melons, maize, and pumpkins should be kept well cultivated, the Planet Junior cultivator being run between the rows every week to keep the ground open and moist. Cow peas, soy beans, velvet beans, and sorghum, as well as rio or bugle pumpkins, may be sown early this month.

THE CLIMATE OF WESTERN AUSTRALIA DURING SEPTEMBER, 1904.

In the notes for July it was pointed out that the character of the disturbances this winter differs considerably from that which has generally been experienced at this time of the year ever since the Observatory was founded. The peculiarity consists in the occurrence of rain of the usual summer monsoonal type, which has passed from the North-West coast inland throughout the interior. In the present month, a repetition of the disturbance of this character gave the vast goldfield districts, including both the Murchison and Coolgardie fields, by far the heaviest fall ever experienced there in the month of September. There were curious features connected with it which makes it worth while to place on record the following particulars:—On Monday morning, the 12th, after a few days' fine weather, the map showed a "low" off the West coast near Geraldton (lat. 29), with cloudy weather throughout the State South of the tropics, and rain on the coast between Geraldton and Fremantle. As a general rule a "low" appearing in this manner may be expected to pass either straight across to the Bight, or down the coast and thence Eastward, giving falling barometers and unsettled weather throughout the South-West and South districts. On this occasion, however, the barometer at Cape Leeuwin was noticed to be rising rapidly, a most unusual thing under the circumstances, and it was evident that a "high" was pushing vigorously into our South-West corner. This latter succeeded in establishing itself and moving Eastward, forming a well-marked feature over our Southern coast districts and the Great Australian Bight. The "low" was apparently swallowed up by this movement and disappeared from the weather map; but the unsettled weather passed across country in a South-East direction just as if the "low" accompanied it, in the teeth of strong Easterly and South-Easterly winds and well-developed "high," giving heavy rains throughout the Murchison and Northern portions of the Coolgardie fields. The weather remained unsettled with scattered showers during the next few days, a moderate "low" following the "high," and then, curiously, the same kind of thing was repeated on the 18th and 19th. This time the rain was more general, but it was again accompanied by the passage of a "high" along our South coast and followed by a "low," which passed overland across our South-West districts to the Great Bight, after most of the rain was over. These heavy rains, and the general character of the present winter season, raise a most interesting and extremely practical question, one of the greatest importance to this State. It refers to the general conditions to be expected throughout the interior. From all the records already taken the normal amount of rain seems to be very small, that for September being about half an inch in the

neighbourhood of Kalgoorlie, and less than a quarter of an inch on the Murchison. It must not be forgotten, however, that these records extend over a period covering one of the most protracted droughts ever experienced in the Eastern States of Australia, and recent investigations by English and Indian meteorologists tend to show that this drought was common to an enormous region, including India and the whole of Australia. It may therefore be that our statistics do not yet represent by any means the true West Australian rainfall, and that the occurrence of these monsoonal storms, which differentiate the present winter from all other since the Observatory was founded (1897), is not so infrequent as our present records would indicate. This, however, cannot be settled for many years—it may take at least 100 to give a fair idea of the normal character of our seasons. At all events, these disturbances introduce a hope that the interior districts may not after all be so barren as they have been supposed to be, and will make our statistics for the next few years of more than usual value. As might be expected from the above, the rainfall map for the month shows a great excess over the average for most of the State South of the tropics. Exception is made in South-West coastal districts between Perth and Albany, where the fall was about, or slightly below, the mean for previous years. In the tropics, as usual at this season, little or no rain fell.

Pressure and temperature were on the whole very slightly below normal. Frosts prevailed occasionally at inland places, and the following table will be of practical use to all cultivators, as it gives the average and absolute lowest readings of a minimum thermometer placed on the surface of the ground.

Station.	Mean.	Lowest.	Date.
Peak Hill	46·9	36·6	23
Cue	45·2	32·4	3
Coolgardie	41·0	26·0	10
Southern Cross	43·4	30·0	10
Walebing	40·2	29·0	10, 11
York	40·7	29·4	2
Perth Observatory	47·3	37·0	2
Wandering	29·5	26·0	29
Narrogin	40·1	24·0	2
Katanning	37·9	25·0	2
Bridgetown	39·7	30·0	9
Karridale	40·5	34·2	2

The Climate of Western Australia during September, 1904.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						September, 1904.					* Average for previous Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	29·954	29·956	30·109	29·829	93·6	73·1	83·4	99·0	68·0	94·6	74·8	103·5	65·0	*Nil*	2917
	Derby	29·958	29·972	30·101	29·839	92·9	66·7	79·8	98·6	58·0	94·5	65·2	103·0	54·5	*Nil*	3182
	Broome ...	29·936	29·981	30·106	29·820	87·3	67·8	77·6	96·8	62·8	88·8	64·5	101·0	54·8	3	2356
	Condon ...	29·975	30·010	30·132	29·834	83·8	57·9	70·8	96·1	48·6	85·5	55·9	98·8	42·0	22	643
	Cossack ...	29·981	30·024	30·122	29·835	84·6	62·6	73·6	96·0	56·0	86·6	61·0	98·2	50·0	185	1323
	Onslow ...	30·000	30·030	30·151	29·842	80·2	56·9	68·6	92·0	52·0	84·2	56·2	101·0	43·5	26	1532
	Carnarvon ...	30·048	30·008	30·218	29·821	72·5	56·1	64·3	76·3	48·8	75·2	56·5	95·7	43·0	77	1092
	Hamelin Pool...	30·025	30·157	30·250	29·790	75·0	51·0	63·0	83·0	47·0	77·1	51·8	96·8	40·0	180	956
	Geraldton ...	30·062	30·111	30·262	29·770	69·6	52·5	61·0	85·2	45·0	70·9	51·8	94·0	39·0	154	1377
Inland:	Hall's Creek ...	30·014	29·996	30·189	29·836	92·3	58·6	75·4	96·8	50·4	93·3	60·3	100·4	42·2	23	2814
	Marble Bar* ...	...	...	...	...	90·7	60·2	75·4	97·0	55·0	92·5	60·0	101·7	42·0	7	1109
	Nullagine ...	29·982	30·012	30·191	29·813	87·0	56·2	71·6	95·0	47·0	87·9	54·0	98·5	38·9	*Nil*	1102
	Peak Hill ...	30·014	30·046	30·230	29·682	74·1	52·1	63·1	89·8	43·8	77·8	52·0	91·0	38·1	161	918
	Wiluna ...	30·001	30·024	30·269	...	75·0	50·1	62·6	88·0	36·5	77·6	48·1	93·8	34·6	280	997
	Cue	30·044	30·078	30·284	29·700	71·9	48·3	60·1	87·2	37·7	76·5	49·8	93·2	37·0	366	1248
	Yalgoo ...	30·022	30·083	30·284	29·707	72·3	48·5	60·4	84·4	38·1	74·9	47·2	93·6	35·7	254	809
	Lawlers ...	30·038	30·066	30·289	29·801	72·2	49·1	60·6	84·0	36·4	74·9	48·6	95·2	34·7	317	989
	Laverton * ...	30·036	30·044	30·281	29·760	71·9	48·9	60·4	84·0	37·5	75·1	48·1	94·5	35·0	265	954
	Menzies ...	30·044	30·072	30·266	29·763	70·1	47·7	58·9	83·0	36·7	72·6	48·0	92·1	33·5	283	828
	Kanowna ...	...	...	...	...	69·0	47·0	58·0	83·8	36·8	68·5	45·8	87·6	37·1	332	819
	Kalgoorlie ...	30·056	30·080	30·309	29·656	69·4	48·4	58·9	82·9	37·0	71·4	48·1	90·8	34·9	329	895
	Coolgardie ...	30·053	30·079	30·282	29·647	68·3	46·4	57·4	83·2	35·2	71·2	46·7	92·0	35·0	204	858
	Southern Cross	30·046	30·064	30·239	29·736	70·6	45·0	57·8	84·0	32·8	71·4	43·8	95·0	31·0	416	1409
	Walebing ...	...	...	...	...	66·6	43·2	54·9	78·8	32·0	66·1	44·0	79·9	34·4	219	1877
	Northam ...	...	...	...	...	68·0	44·7	56·4	80·0	32·5	67·4	45·2	80·6	35·6	223	2092
	York	30·078	30·099	30·287	29·762	67·5	43·9	55·7	77·8	31·0	68·2	43·0	84·7	31·8	235	1905
	Guildford* ...	...	...	...	...	68·6	49·8	59·2	81·0	39·2	67·4	48·4	83·0	37·7	169	2982

* Averages for three years only.

The Climate of Western Australia during September, 1904—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. September, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:															
Perth Gardens ...	30·080	30·092	30·295	29·772	67·3	53·6	60·4	79·0	44·0	68·0	49·7	87·6	35·0	253	2986
Perth Observatory	30·088	30·106	30·314	29·791	65·8	51·1	58·4	78·6	41·8	66·0	50·3	86·4	39·0	260	2938
Fremantle ...	30·086	30·097	30·308	29·816	65·0	53·5	59·2	79·0	43·5	64·6	52·7	84·0	41·8	263	2743
Rottnest ...	30·084	30·089	30·278	29·785	64·3	53·9	59·1	76·4	46·0	64·4	53·8	83·0	42·6	189	2321
Mandurah ...	...	...	...	...	65·4	48·5	57·0	78·0	35·0	65·0	51·5	82·0	35·0	280	3221
Wandering ...	...	...	...	...	65·1	43·5	54·3	78·0	38·0	58·6	40·1	73·9	30·0	278	2629
Narrogin ...	...	...	...	...	62·0	44·3	53·2	75·6	31·0	...	...	...	...	342	2095
Collie	...	...	...	...	64·4	41·0	52·7	79·0	30·4	62·9	42·6	77·5	31·9	259	2915
Donnybrook ...	...	...	...	...	64·9	44·2	54·6	76·5	32·1	64·1	48·0	74·2	33·8	230	2957
Bunbury ...	30·094	30·094	30·328	29·809	64·9	48·4	56·6	75·5	37·0	65·2	49·6	83·8	32·2	191	3015
Busselton ...	...	...	...	...	65·2	45·9	55·6	75·0	34·0	63·6	48·6	78·8	37·8	145	2542
Cape Naturaliste	30·090	...	30·334	29·779	62·3	51·0	56·6	71·5	45·0	...	...	...	...	193	2600
Bridgetown ...	...	...	...	...	64·5	42·0	53·2	79·0	32·0	63·4	42·9	79·0	32·2	267	2494
Karridale ...	...	30·078	...	...	62·8	49·9	56·4	73·0	41·0	63·2	48·7	82·5	31·5	344	3535
Cape Leeuwin ...	30·057	30·027	30·322	29·618	63·2	54·0	58·6	70·0	47·4	62·6	53·6	79·5	43·8	230	2993
Katanning ...	30·076	30·071	30·358	29·783	63·4	43·7	53·6	77·0	32·0	64·0	43·5	81·1	29·8	277	1620
Albany	30·074	30·042	30·357	29·738	63·1	47·5	55·3	68·8	38·8	63·6	47·5	81·4	34·0	375	3547
Breaksea... ...	30·070	30·034	30·377	29·582	59·1	51·1	55·1	65·8	45·2	61·2	50·6	84·2	40·0	324	2731
Esperance ...	30·054	30·058	30·440	29·605	66·9	48·2	57·6	79·5	39·5	66·6	48·4	96·0	34·0	352	2534
Balladonia ...	30·090	30·020	30·373	29·574	68·2	43·7	56·0	87·2	33·0	70·0	45·4	86·8	35·6	180	843
Eyre*	30·044	30·068	30·343	29·481	67·9	46·4	57·2	88·0	30·2	67·9	46·9	90·2	31·3	73	1122
INTER-STATE.															
Perth	30·088	30·106	30·314	29·790	65·8	51·1	58·4	78·6	41·8	66·0	50·3	86·4	39·0	260	2938
Adelaide	30·110	30·071	30·460	29·740	60·7	46·0	53·4	79·6	37·9	66·5	47·9	90·7	32·7	69	1753
Melbourne	30·046	29·922	30·403	29·571	59·1	43·3	51·2	69·2	35·1	62·6	45·4	81·8	32·1	126	2579
Sydney	30·050	30·047	30·270	29·730	66·0	49·0	57·5	81·0	42·0	66·3	51·4	89·8	40·8	99	4226
Cocos Island ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Averages for three years only.

The Observatory, Perth, October, 1904.

W. E. COOKE, Government Astronomer.

RAINFALL for August, 1904 (completed as far as possible), and for September, 1904 (principally from Telegraphic Reports).

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
East Kimberley:				
Wyndham ...	Nil	...	Nil	...
6-Mile	...	...	...	...
Carlton	Nil	...	...	...
Rosewood Downs	Nil	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	3	1
Hall's Creek ...	Nil	...	23	1
Nicholson Plains	...	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	Nil	...	...	...
West Kimberley:				
Obagama ...	...	...	...	...
Beagle Bay ...	Nil	...	...	...
Derby	Nil	...	Nil	..
Yeeda	...	...	...	...
Liveringa ...	Nil	...	...	...
Leopold Downs...	Nil	...	...	...
Fitzroy Crossing	Nil	...	2	2
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	Nil	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	3	1
Roebuck Downs	Nil	...	...	...
Thangoo... ...	...	...	...	...
La Grange Bay...	Nil	...	8	1
North-West:				
Wallal	Nil	...	3	1
Condon	60	1	22	1
Pardoo	142	1	...	...
DeGrey River ...	Nil	...	...	...
Port Hedland ...	47	1	23	1
Boodarie ...	53	1	...	...
Warralong ...	169	1	...	...
Muccan	Nil	...	...	...
Ettrick	...	...	...	...
Mulgie	95	1	...	...
Eel Creek ...	...	...	...	...
Station Peak ...	136	2	34	2
Coongon... ...	Nil	...	...	...
Warrawagine ...	82	1	...	...
Bamboo Creek ...	81	1	23	1
Marble Bar ...	78	1	7	2
Warrawoona ...	121	1	22	1
Corunna Downs...	54	1	...	...
Nullagine ...	123	1	Nil	...
Mt. Edgar ...	...	...	...	...
Kerdiadary ...	Nil	...	...	...
Roy Hill... ...	36	1	...	...
Middle Creek ...	98	1	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	Nil	...	...	...
Woodstock ...	17	1	...	...
Mt. Florence ...	Nil	...	...	...
Tambrey ...	Nil	...	...	...
Millstream ...	68	1	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	3	1	91	2
Cooyapooya ...	48	1	...	...
Woodbrooke ...	...	...	...	...

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
NORTH-WEST—*cont.*				
Croydon	Nil	...	...	...
Balla Balla ...	...	...	...	...
Roebourne ...	Nil	...	145	2
Cossack	Nil	...	185	2
Fortescue ...	Nil	...	96	2
Mardie	Nil	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	Nil	...	...	...
Onslow	1	1	26	2
Peedamullah ...	Nil	...	...	...
Red Hill	Nil	...	...	...
Mt. Mortimer ...	...	...	...	...
Peake Station ...	Nil	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	Nil	...	...	...
Point Cloates ...	34	1	...	...
GASCOYNE:				
Winning Pool ...	7	1	149	3
Coordalia ...	...	...	...	...
Towara	Nil	...	...	...
Ullawarra ...	Nil	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	Nil	...	...	...
Bangemall ...	Nil	...	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	7	2	...	...
Yanyeareddy ...	13	2	...	...
Williambury ...	Nil	...	...	...
Booloogooroo ...	...	...	...	...
Wandagee ...	...	...	...	...
Minilya	14	1	...	...
Bernier Island ...	67	8	...	...
Boolathana ...	Nil	...	...	...
Carnarvon ...	14	2	77	4
Brick House ...	30	2	...	...
Doorawarra ...	54	2	...	...
Bintholya ...	...	...	...	...
Mungarra ...	12	2	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	5	1	...	...
Upper Clifton Downs	12	2	...	...

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
GASCOYNE—*contd.*				
Dirk Hartog Island	..	...	...	...
Sharks Bay ...	40	1	99	6
Kararang ...	...	...	...	...
Meedo	7	1	...	...
Tamala	78	7	...	...
Wooramel ...	35	4	62	5
Hamelin Pool ...	34	5	180	6
Byro	25	1	...	...
Yarra Yarra ...	14	1	...	...
Berringarra ...	35	2	...	...
Mt. Gould ...	9	2	...	...
Moorarie ...	6	1	...	...
Wandary... ...	...	...	...	...
Peak Hill ...	Nil	...	161	5
Horseshoe ...	4	1	...	...
Mt. Fraser ...	Nil	...	125	7
Abbotts	15	2	226	5
Belele	8	1	396	8
Mileura	9	1	...	...
Milly Milly ...	7	1	...	...
Manfred ...	12	3	...	...
New Forest ...	29	2	...	...
Woogorong ...	11	1	...	...
Boolardy ...	...	...	...	...
Twin Peaks ...	12	1	...	...
Billabalong ...	15	2	102	8
Wooleane ...	2	1	...	...
Murgoo	26	3	97	7
Yallalonga ...	...	...	...	...
Meka	23	1	...	...
Mt. Wittenoom ...	20	1	...	...
Nannine	24	2	392	8
Star of the East...	26	2	374	7
Annean	17	2	...	...
Coodardy ...	10	1	...	...
Cue	16	1	366	9
Day Dawn ...	29	3	346	9
Lake Austin ...	16	1	501	9
Lennonville ...	39	4	381	9
Mt. Magnet ...	38	3	325	10
Challa	18	3	...	...
Youeragabbie ...	...	...	342	6
Murrum	Nil	...	...	...
Burnerbinmah ...	18	5	280	11
Barnong... ...	29	4	...	...
Mellenbye ...	82	10	243	10

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
Gascoyne—*contd.*				
Yalgoo	25	4	254	9
Wagga Wagga	15	2	251	9
Gabyon	14	2	232	8
Gullewa	...	...	218	10
Muralgarra	28	4	267	9
Wydgee	21	2	...	...
South-West Division (Northern Part):				
Murchison House	145	11	...	...
Mt. View	67	5	...	...
Mumby	154	10	241	9
Yuin	12	1	163	6
Northampton	159	12	231	9
Oakabella	165	8	...	...
Narra Tarra	...	...	...	...
Tibradden	...	...	...	...
Myaree	103	12	213	10
Sand Springs	146	8	...	...
Mullewa	55	9	226	10
Kockatea	52	6	...	...
Bootenal	134	3	...	...
Geraldton	139	10	154	15
Greenough	108	6	148	9
Bokara	152	12	232	12
Dongara	137	9	119	6
Dongara (Pearse)	136	9	119	6
Strawberry	116	9	207	10
Nangetty	...	...	...	...
Mingenew	116	14	138	12
Urella	...	...	134	5
Yandenooka	159	9	208	8
Rothesay	52	2	451	8
Field's Find	18	5	319	10
Carnamah	96	10	230	12
Watheroo	110	11	196	8
Dandaragan	222	15	199	13
Moora	153	11	194	12
Yatheroo	305	14	...	...
Walebing	183	15	219	13
Round Hill	...	...	118	8
New Norcia	320	14	151	8

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	592	12	221	14
Belvoir	605	14	187	11
Mundaring	629	16	239	14
Wandu	561	18	199	14
Guildford	560	15	169	12
Kalbyamba	426	17	220	15
Canning W't'r'w'ks	512	12	244	12
Perth Gardens	584	16	253	16
Perth Observatory	534	18	260	15
Subiaco	450	17	278	15
Fremantle	412	20	263	16
Rottnest	372	16	189	14
Armadale	608	...	...	...
Rockingham	681	19	334	11
Jarrahdale	1,295	20	485	16
Mandurah	576	17	280	13
Pinjarra	709	19	188	8
Yarloop	641	19	252	14
Harvey	548	19	225	12
Upper Murray	695	20	268	12
South-West, Central Part (Inland):				
Hatherley	214	9	182	9
Dowerin	181	9	186	7
Momberkine	333	7	213	9
Monglin	253	7	...	...
Newcastle	380	10	195	8
Eumalga	391	10	197	11
Northam	214	12	223	9
Grass Valley	190	8	252	7
Meckering	166	11	180	8
Cunderdin	87	7	291	8
Codg-Codgin	127	13	...	...
Yarragin	75	8	...	...
Doongin	110	7	307	6
Cuttenning	139	12	326	9
Whitehaven	64	6	...	...
Sunset Hills	200	11	201	9
Cobham	311	17	257	13

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
South-West, Central—*contd.*				
Yenelin	196	10	296	10
Mt. Caroline ...	116	6	466	5
York	268	17	254	13
Dalbridge ...	328	15	203	9
Beverley ...	272	11	235	7
Bally Bally ...	240	15	291	12
Barrington ...	330	13	209	10
Stock Hill ...	209	6	296	7
Sunning Hill ...	282	12	278	11
Brookton ...	251	9	248	10
Wandering ...	437	13	278	9
Glen Ern ...	328	11	378	11
Pingelly ...	287	8	261	9
Marradong ...	439	12	256	11
Bannister ...	481	13	...	...
Wonnaminta ...	315	16	223	12
Narrogin ...	282	19	303	14
Narrogin State Farm	315	6	242	11
Wickepin ...	248	8	...	...
Gillimaning ...	253	13	...	...
Bunking ...	221	10	299	8
Bullock Hills ...	79	5	254	9
South-West Division (Southern Part):				
Bunbury ...	405	21	191	11
Collie	488	18	259	12
Glen Mervyn ...	462	13	232	11
Donnybrook ...	481	19	230	15
Boyanup ...	538	19	167	14
Ferndale ...	477	15	233	15
Busselton ...	366	20	145	13
Quindalup ...	434	22	226	18
Cape Naturaliste	428	19	193	19
Lower Blackwood	567	16	262	18
Karridale ...	502	25	344	19
Cape Leeuwin ...	359	25	230	23
Biddellia ...	503	19	...	...
The Warren ...	834	21	459	18
Lake Muir ...	420	17	...	...
The Peninsula ...	356	25	195	22

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
South-West—*continued.*				
Mordalup ...	378	16	276	5
Deeside	541	20	...	...
Riverside ...	493	17	250	14
Balbarup ...	505	14	...	...
Wilgarup ...	469	22	252	20
Bridgetown ...	352	16	267	16
Westbourne ...	295	18	...	...
Hillton	300	6	163	7
Greenbushes ...	302	16	314	11
Greenfields ...	358	12	234	11
Glenorchy ...	360	12	218	8
Williams ...	281	11	274	15
Arthur	242	8	237	12
Darkan	239	8	178	6
Wagin	231	12	229	10
Glencove ...	174	15	205	15
Dyliabing ...	154	14	203	10
Katanning ...	247	17	277	14
Kojonup ...	310	18	275	20
Broomehill ...	276	14	245	15
Sunnyside ...	206	15	275	20
Talbot House ...	...	...	223	13
Woodyarrup ...	192	14	260	15
Mianelup ...	132	9	269	14
Cranbrook ...	...	...	...	...
Toolbrunup ...	146	15	204	14
Tambellup ...	147	16	209	18
Blackwattle ...	359	15	...	...
Woogenellup ...	197	18	241	15
Mt. Barker ...	280	19	341	16
Kendenup ...	249	15	320	15
St. Werburgh's...	285	19	...	...
Forest Hill ...	365	18	319	16
Denmark ...	...	...	...	...
Grasmere ...	395	18	391	21
Albany	384	20	375	22
King River ...	345	13	351	8
Point King ...	413	18	391	19
Breaksea ...	248	17	324	23
Cape Riche ...	125	9	...	...
Cherilallup ...	167	12	287	12
Pallinup ...	166	11	241	15
Bremer Bay ...	133	13	294	13
Peppermint Grove	175	15	384	18
Jarramongup ...	...	...	...	...

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
Eastern Division:				
Dural	10	3	188	7
Wiluna	22	4	280	6
Gum Creek ...	Nil	...	325	8
Mt. Sir Samuel ...	28	3	284	7
Lawlers	9	1	317	13
Leinster G.M. ...	24	4	353	8
Darda	5	1	380	7
Lake Darlôt ...	...	...	...	...
Mt. Leonora ...	34	3	328	11
Mt. Malcolm ...	15	2	257	10
Mt. Morgans ...	15	2	422	10
Burtville ...	16	1	186	7
Laverton ...	18	1	265	9
Murrin Murrin...	18	2	383	9
Yundamindera ...	13	3	334	10
Tampa	39	2	266	7
Kookynie ...	44	2	297	11
Niagara	35	2	247	9
Yerilla	133	3	324	11
Edjudina ...	60	4	449	8
Menzies	52	4	283	14
Mulline	7	3	290	10
Waverley ...	22	2	267	14
Goongarrie ...	37	6	335	10
Mulwarrie ...	6	1	255	10
Bardoc	20	2	269	8
Broad Arrow ...	23	4	318	11
Kurnalpi ...	81	5	377	11
Bulong	102	4	351	8
Kanowna ...	66	4	332	10
Kalgoorlie ...	25	5	329	13
Coolgardie ...	24	5	204	14
Burbanks ...	13	3	250	11
Woolubar ...	23	3	257	11
Widgiemooltha...	39	5	245	10
50-Mile Tank ...	66	4	190	7
Waterdale ...	43	5	287	13
Norseman ...	98	8	169	7
Lake View ...	146	10	213	11
Bulla Bulling ...	20	5	230	12
Boondi	39	7	261	12
Boorabbin ...	42	7	211	10
Eastern—*contd.*				
Koorarawalyee ...	103	3	293	7
Karalee	24	2	239	7
Yellowdine ...	8	1	268	7
Southern Cross...	59	10	416	9
Parker's Range...	45	10	318	13
Parker's Road ...	27	5	303	6
Mt. Jackson ...	Nil	...	174	10
Bodallin ...	163	7	354	7
Burracoppin ...	94	4	243	6
Kellerberrin ...	154	9	289	6
Merriden ...	79	6	337	5
Nangeenan ...	54	9	397	7
Mangowine ...	100	6	...	...
Wattoning ...	...	...	...	...
Noongarin ...	64	6	438	6
Eucla Division:				
Ravensthorpe ...	123	12	376	12
Coconarup ...	98	10	...	...
Hopetoun ...	210	10	414	11
Fanny's Cove ...	...	...	...	...
Park Farm ...	203	12	...	...
Esperance ...	342	14	351	11
Gibson's Soak ...	186	13	253	12
30-Mile Condenser	141	12	217	12
Swan Lagoon ...	159	11	202	10
Grass Patch ...	156	14	...	...
Myrup	282	15	314	14
Lynburn ...	256	13	...	...
Boyatup... ...	306	17	...	..
Middle Island ...	165	12	204	14
Point Malcolm ...	256	15	242	12
Israelite Bay ...	197	14	213	10
Balbinia... ...	77	7	192	10
Frazer Range ...	...	...	...	...
Balladonia ...	97	8	180	6
Southern Hills ...	63	5	...	...
Eyre	100	14	73	6
Mundrabillia ...	14	1	...	...
Eucla	51	11	73	5

The Observatory, Perth,
10th October, 1904.

W. E. COOKE,
Government Astronomer.

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NOTES.

ANNUAL SUBSCRIPTIONS.—In order to assure the receipt of the *Journal* for the coming year, subscribers should remit their subscriptions so that the same will reach the Department before the end of the present year.

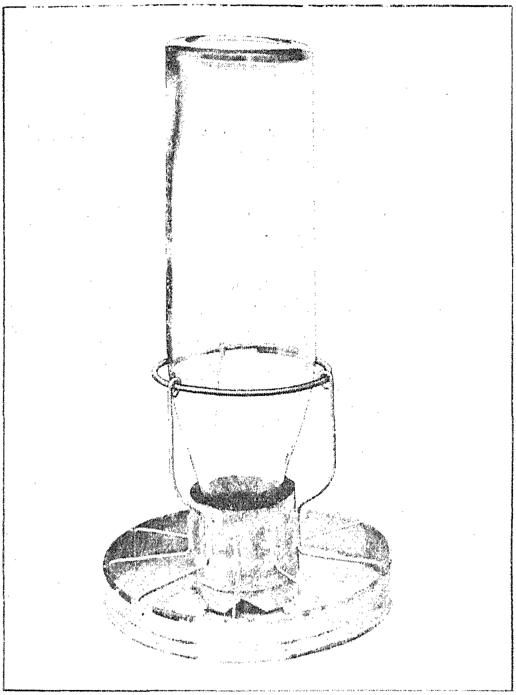
NEW BULLETINS.—Two new *Bulletins* have been issued this month—No. 15, "The Modern Silo," and No. 16, "Feeding of Poultry, Chicks, and Ducklings." These can be obtained from the Department, or will be forwarded on receipt of a penny stamp for each copy required.

DRINKING FOUNTAIN FOR YOUNG POULTRY.—In this issue is illustrated a very good style of drinking fountain for young chicks and ducklings. It prevents the young birds from getting wet, ducklings being especially prone to dabbling in water, which invariably brings on cramps and death. The fountain is made by Mr. Goss, of Murray Street, Perth, who will give any further particulars required.

ANNUAL SHOWS.—Great strides have been made during the past year in all agricultural and stock matters, if the various shows just held are to be taken as a criterion. The exhibits have been much more numerous and of a far superior kind. The spirit of emulation has been aroused and heartily responded to. It is to be hoped that the great improvements and advancement made during the last twelve months will be exceeded during the coming year.

PRIZES FOR GOVERNMENT STOCK.—The following is a list of prizes gained at the late Royal Agricultural Show by stock exhibited from the Chapman Experimental Farm:—Dexter bull, first and champion; Dexter cow, first and champion; Dexter cow, second; Shropshire ewe ($1\frac{1}{2}$ years), second; Angora goats, first and second; sheaf of hay, first; Large Black pigs (boars), first and second; Berkshire (boars), third; Dorking cocks, first; Dorking hens, first; turkey hen (American Bronze), first; turkey gobbler (American Bronze), second. At the same show an Ayrshire bull, the only animal exhibited from the Narrogin Experimental Farm, took third prize. At the Mammoth Show held at Geraldton the following prizes were gained by the Chapman Experimental Farm exhibits:—First prizes were awarded to a Suffolk stallion, Dexter bull, Dexter cow, Berkshire boar, Large Black boar, wheaten hay, turnips, peas, turkey cock, and turkey hen; while second prizes were gained by a Shropshire ram, Shropshire ewe, and turnips. The exhibits shown at Narrogin from the Narrogin Experimental Farm, though not for competition, came in for considerable praise, and would no doubt have scored well in the list had they been entered for competition.

MILKING NERVOUS COWS.—It may perhaps surprise some people to hear that, according to Professor Primrose McConnell, the most nervous cows are the best milkers. The idea was first promulgated by Mr. Hoard, editor of *Hoard's Dairyman*, and ex-President of the State of Wisconsin Agricultural College, where Professor Henry and Dr. Babcock carry on their world-famous dairy experiments. He found that the ability to yield milk was intimately connected with the nervous organisation of the animal, and that the more highly the nerves of the animal were strung—so to speak—the greater was the power to yield milk. This intimate connection between nerves and milk is very commonly exemplified in the phenomenon known as "holding up the milk;" if the animal has her temper ruffled, or is frightened or annoyed in any way, the milk ceases to flow easily. The cow does not knowingly keep her milk back, but simply the reflex action of her ruffled nerves causes a stringency of the tissues of the milk bag, and the milk ceases to come until she gets into a calm state of mind once more. The fat, phlegmatic specimen does not ruffle easily, and does not hold up her milk, but she will never yield so well by the week or by the year as the other. On the other hand, the animal with the thin tail and the thin flank, the intelligent eye, and the quick movement is the one that will milk well if she gets the chance. It all depends, however, on the chance she gets. The man who hits her with his stool, and swears every time he approaches her, will wreck such a cow in a fortnight. If, however, she is made a pet and kindly treated she will respond at the pail in an astonishing way, for her nervous vigour will then get outlet in the secretion of rich milk.



Goss' Drinking Fountain for young chicks and ducklings.

THROUGH THE BRIDGETOWN DISTRICT.

By GEO. W. WICKENS.

Having just returned to Bridgetown from a trip through the Upper Blackwood country, perhaps a few notes on that portion of this district will be of interest to readers of the *Journal*.

To one who knows what an extremely profitable investment fruit-growing has proved in this State for the past 12 years, it is a source of great wonder that the settlers on the Upper Blackwood have not availed themselves more fully of the ideal conditions prevailing—both soil and climate being eminently suitable—and gone in largely for the production of fruit.

Until quite recently the majority of orchards in the above-mentioned districts consisted of one or two acres planted for home use only. Though as an instance of how profitable even small orchards are, I may mention that one grower sold last season £100 worth of fruit from three acres of six-year-old trees; and over and above that quantity had a liberal supply for home use right through the season.

Within the last 12 months, however, there has been a marked increase of settlement, and as the holdings are small compared with the immense runs of former years, most of the newcomers are turning their attention to fruit culture, so as to get the biggest return possible from the money spent in clearing the land—a very expensive item in this district.

The majority of new settlers are from the goldfields of this State, and have had no previous experience in orchards, but they are tackling the work with an energy that promises well for their future success. Three places in particular I noticed on the Blackwood, where this time last year there was nothing but virgin forest, now there are three orchards of five, five and a-half, and seven acres, respectively, besides a cottage and outhouses on each block. One of these settlers said that the lectures delivered by Mr. Wilbur, at the goldfields, induced him to try his luck in the South-West.

There seems to be a strong desire on the part of some to go in largely for oranges in this district, and to do so is to court failure. Even after the trees have become acclimatised, so that the frost does not injure them to any great extent, the fruit borne by the trees is of very inferior quality, and cannot compare with that grown in the higher latitudes of this State, the rind here being three times the thickness, and juice almost absent.

Peaches do well, and several growers realised 30s. per case for "Briggs' Red May," last season. "Royal George" and "Elberta" both bear well, though the latter is very subject to leaf-curl, and every tree of that variety should be sprayed with strong Bordeaux mixture, at least twice during dormant period, the second spraying to take place just before buds burst. It is not at all a good plan to leave the trees until the disease can be seen on the leaves, and then to tackle it with light summer-strength solution, for after the leaves are affected nothing will render them free, and the best that can then be done is to check the fungus from spreading. It ought always to be borne in mind that Bordeaux mixture is only preventive in its action, and not a cure. After the winter dressing has been thoroughly carried out, a summer-strength spray just after the young fruit has formed will be found very beneficial.

Plums, especially the Japanese varieties, grow and bear excellently. From observations I have made I have come to the conclusion that "Burbanks" and "Sutsuma" are the most profitable at present, though there are a number of new varieties which I have had no opportunity to see fruiting. Both those mentioned are heavy, regular, and early bearers. "Kelsey" and "Wickson," though praised highly in nearly all the catalogues, have, in places where the trees are growing vigorously, a most disappointing habit of shedding their fruit soon after it has formed, trees covered with blossoms maturing only a very small percentage of fruit.

It is impossible to exaggerate the capabilities of this country for apple-growing. I know of no single variety that does not do well, and when the export trade finally comes along, as it is bound to in time, there must be a great future before the South-West. Three varieties that are most profitable to growers at the present time are "Jonathan," "Rome Beauty," and "Rokewood." Each of these is an early and heavy bearer, and they follow one another nicely in order of ripening, thus being perfectly suited for the local market. "Jonathans" can be gathered in April, and sold in the months of May and June. "Rome Beauty" are gathered towards the middle and end of May, and can be stored till July. "Rokewood" I have seen hanging on the trees in July after all the leaves have fallen, making the trees one blaze of colour. This latter variety can be stored till November, though there is no advantage in keeping them till that time, as early fruits are then ripe; the best months to sell in being September and October.

It should be remembered when planting that both "Rome Beauty" and "Rokewood" are too late for the English market; "Jonathan," "Cleopatra," "Yellow Newtown Pippin," and "Munroe's Favourite" being amongst the best for this purpose.

Some years ago I had an interest in a consignment of 100 cases apples, mixed varieties, sent as a trial shipment from Victoria to London. "Jonathan" and "Munroe's Favourite" arrived in perfect condition, being the best sent, while "Northern Spy" landed in very bad order, being absolutely the worst.

Intending growers are continually asking if it is advisable to continue planting orchards, considering the great amount of fruit grown in the Eastern States and the comparatively low cost at which it can be landed in the Western Australian market. I certainly think that no matter what amount of fruit is grown on the other side of Australia, the orchardist here need not be afraid of being beaten out of the local market by imported fruit. A case in point came under my notice quite recently, where "Rokewood" apples, grown at the Upper Blackwood, realised 18s. 6d. per case in the auction-room at Perth, the imported article selling at the same time for 11s. per case.

The main thing the grower here has to bear in mind in sending his fruit to market is the great necessity for properly grading and packing. Even though it takes up a great deal more time, it pays handsomely in the end: for no matter how individually perfect each fruit may be, if all are packed into cases indiscriminately, large and small together, the result of the sale is bound to be disappointing; and just as important, especially where the train journey is long, is the necessity of filling the case tightly from top to bottom. A case of apples well packed can be picked up and shaken violently from side to side without a single fruit moving in the case.

In an orchard I visited last season I saw the ordinary packer being filled from the side with apples; the fruit was placed loosely in until slightly above the edge of the box, then the whole lot was given a thorough shake to place the apples in position, and the side, consisting of three boards, was nailed on. It is not necessary to have a very vivid imagination to realise what the fruit was like after travelling 200 miles by train.

Referring once more to the idea that fruit-growing will not pay in the future, what better object-lesson can we have than that afforded by Tasmania, who, in spite of the present enormous yield, keeps increasing the area under orchards year by year, though long since the production has been far greater than the quantity necessary for her own consumption. If Tasmania can grow apples and export them profitably, surely Western Australia, with equally suitable soil and climate and the great advantage of being nearer the world's market, can also export them profitably.

The way to get more out of poultry is to put more into it. We do not mean money only. An investment of some money is, of course, necessary, but other things are more important.

The breeder who sells eggs on the market in considerable quantities should see to it that the eggs are uniform, or nearly so, in colour. This is important in some markets. Eggs should be assorted if the flock does not lay eggs uniform in colour.

INTRODUCTION OF LADYBIRDS.

By E. BAILEY.

The work of introducing beneficial insects into this State from abroad to combat our insect pests is being followed up by this Department and attended with success.

In 1900, Mr. Lea, Government Entomologist of Tasmania, formerly entomologist here, sent us some strong colonies of a useful aphis-eating ladybird (*Leis conformis*). These were liberated in various gardens in Perth. *Leis conformis* is a yellow ladybird, with about 16 large black spots in transverse rows across the wing covers, varying and sometimes merging into one another and forming irregular black lines. This is now established in this State, and since their introduction I have collected and sent away 25 colonies to the country to combat various kinds of aphis, and especially woolly aphis of apple trees.

Other ladybirds introduced are *Cryptolaemus montrouzierii*, a most useful ladybird, because most destructive to the mealy bug (*Dactylopius sp.*). Black on wing covers, head and thorax yellowish brown, and also tips of wings and underneath. The larva is covered with a white fluffy wool, and when young might be mistaken by an inexperienced eye for the mealy bug itself. It is well established with us, especially on the plantains and orange trees in Perth which have mealy bug; it also feeds on *Spœrococcus* or *Pinus sp.*

Orcus Lafertei and *Orcus Chalybeus* were introduced in 1902 from New South Wales, but since I liberated them I have been unable to find any of the progeny. The former has a uniform brown on wing covers, and the latter a bright blueish green on wing covers and yellow ochre underneath. Both are scale feeders.

A few of two other useful scale feeders (*Veronia lineola* and *Platyonius lividigaster*) also from New South Wales, were liberated, but probably perished.

Other ladybirds have been sent us by Mr. Compère from Seville, Marseilles, Malaga, and Sicily, our latest consignment being a ladybird with brown wing covers, except for six yellow spots, three on each side transversly, and brown head and thorax; dull yellow underneath. This ladybird came from Jerusalem, being a useful enemy to red scale, but in its native home heavily parasitised. These parasites are carefully destroyed in the breeding jars, and, as the ladybirds change from pupæ into imago beetles, are liberated. Those already liberated can be seen busily feeding on the red scale, and apparently taking kindly to their adopted home.

CHICKEN REARING.

By FRANK H. ROBERTSON.

If all the eggs which are set under hens, also those which are put into incubators, hatched each a good, strong, live chicken or duckling, and all said ducklings and chicks grew up fine, strong, healthy birds and laid eggs plentifully, or peacefully terminated their existence plump and fat, boiled or roasted, before months of adult age had been reached, all would be well, and everyone who had even the smallest back yard would be raising chickens; the poorest in the land would have eggs galore for breakfast, puddings, and cakes; roast fowl or duck would be seen on the table probably every Sunday, instead of once or twice a year, such as Christmas time, weddings, banquets, and other festive gatherings.

But the raising of poultry, etc., if above were the case, would, of course, mean that the prices and profits would be very low indeed, and the industry, under such conditions, would not yield anything like the profits now obtainable, so the fact that the raising of fowls and ducks requires a certain amount of skill and experience makes the occupation a profitable one to those who give it the requisite attention.

There are a great many persons taking up poultry raising this season, and many of them are not so successful in raising chickens as they had anticipated; feelings of chagrin and disappointment are freely expressed, and they at once come to the conclusion that poultry breeding is not so good as is generally supposed. The fact of the matter is that too big a result is looked for and definitely expected. In hatching and raising chickens many experienced poultrymen will say that in setting eggs in fairly large numbers, say 600 eggs, and from them raise to maturity 200 good strong fowls, they are quite satisfied, but to the novice poultry-keepers these results look too small, and give them the impression that they are making a miserable failure of their operations. There are so many mishaps incidental to chicken raising which do occur, even in the best-tended yards, that if a larger yield than 33 per cent. is attained the owner can consider himself extra clever, or blessed with good luck. Yes; there is certainly good luck and bad luck with chickens, but what is too often called bad luck is in reality bad management. Anyhow, irrespective of good or bad fortune, the following are a few of the causes which reduce the output:—Take, for instance, say, 50 eggs under four different hens, all from good healthy breeding stock, showing good fertility, say three eggs get broken in the nests, seven eggs unfertile, another five are fertile but do not hatch, three chickens get smothered or trampled on in

hatching—all these very simple and frequent mishaps reduce the number to 32 chickens hatched—then perhaps three of these are weak and die off in a few days, the number of really strong chickens that a start is made with is thus very easily shown as being reduced to 29; now, suppose all goes well, the chickens are properly looked after, thrive, and grow to six months' old, when they are fit to sell, but during that period it will be extraordinary if some do not meet with accidents of one kind or another, which we will put down as four, thus making the total raised of 25 from 50 eggs set. If such a result is obtained it can be considered very good, but there are so many other causes of loss that are likely to occur; then there are the losses from death, so often due to improper feeding causing bowel troubles; so that, taking everything into consideration, it will be found that, if 100 chicks are raised to full-grown healthy fowls from 300 eggs set, satisfactory results are obtained; yet one so often hears of people talking about their want of success in hatching and rearing when they only raise 60 chickens out of 100 eggs, when in reality they are doing well but do not know it.

On the other hand it must be admitted that there are a great many failures in chicken rearing, even with persons who take a considerable amount of care in tending to their poultry. In the first place, eggs from stock which are kept in small runs never hatch so well as those from fowls which have free and unlimited run, and if the stock birds are of a weakly constitution results will be still worse; therefore, to get strong chicks use eggs from strong and vigorous stock; having obtained such and set the hen or hens, test the eggs on the seventh day by holding them up to a bright light at night time, and remove all which are quite clear. These can be used in the house for cooking purposes. To test the eggs cut a hole in a piece of cardboard, the shape of, but slightly smaller than the average egg, hold the egg in the aperture thus made within two or three inches of the light, its contents can then be clearly seen. If the eggs had been set fresh, and the hen regularly removed and fed once a day, the chickens will begin hatching on the twentieth day, and should be all out by mid-day on the twenty-first day, but during the hatching process leave the hen alone, and suppress all feelings of curiosity as to how things are progressing. The hen knows her work better than you do, and indignantly resents all assistance should any be offered.

On the morning of the twenty-second day take the hen and chickens off the nest and give the hen a good feed and a drink; about the best thing to give her is whole maize, as she is fond of it and the chickens cannot eat it; having fed the hen, she will now nestle down quietly on her chickens, and she can, as a rule, be left alone for a few hours; but if the chickens are running about looking for food let them have some, but do not be in a hurry, as the chicken is by nature supplied with excellent nourishment in the shape of the yolk in the egg it came out of, and does not require

food too soon. The first meal can consist of flaked oatmeal and boiled egg, which should be mixed up until quite dry, and add to it a small quantity of fine, crushed, sharp gravel; the want of grit is one of the most common causes of chickens going wrong, so to make sure that they do get it mix a little with the feed. Another valuable ingredient is crushed charcoal and a little fine bonemeal. Fine chopped greenstuff should be given every day. Right from the start, a little animal food, and always clean, cool water. It will be found best to rely chiefly on dry foods, such as well-crushed stout oats, flaked wheat, crushed maize, and canary seed, giving the soft feed as a change, but, above all, never overfeed; little and often is the motto. But if more feed is put down than the chickens will eat up clean disaster is likely to follow, causing bowel trouble, indigestion, diarrhœa, etc. The chickens will often be squeaking, as if they were hungry, but if a glance at their crops shows that they are well filled, do not give them anything.

Lice must be guarded against. Be quite sure that the sitting hen and the box she sits in are both quite clean. A good dusting of insectibane on the hen and nest a few days before the eggs are due is a safe precaution, and on removal of the hen and chickens to fresh quarters see that the red mite is not there in hiding. To find this out paint all crevices, cracks, and corners with kerosene, and if it contains any vermin they will soon come out. Tick must also be guarded against. If the yard has been at all tick-infected the chickens must be reared quite away from the spot where they were located; as, although the tick had to all appearances been eradicated, there may be a few odd tick about, which, on laying their eggs and hatching, the young tick would soon find a convenient host in the young chickens, and thus be the medium of starting afresh this undesirable pest.

A safe way of handling the hen with her young brood would be to keep them for the first week in an empty shed or loose box; then, if possible, remove them to a small run which adjoins a grass plot to which the chicks have access; or, if such is not practicable, use a watertight movable coop with slatted front and no floor, as the wooden boards are too hard for chickens to rest on, but if the ground is wet slip under the coop an old corn-sack, which should be taken out and cleaned daily. If the sack is covered with dry, fine sand, it can be easily kept clean.

Chickens often suffer severely from cold in the early morning. Both they and the mother keep wandering about at daybreak looking for food, and, finding none, if the chickens are young, they feel very miserable, and the weakest of them perish. To avoid this a good plan is to go round all the chicken coops at night time and place a small quantity of dry-crushed grain close to each lot, so that they can get a small feed before the usual feeding time comes round, which is often some hours after the time they first started running about.

When the hen has left the chickens, care must be taken to see that they are comfortably sheltered at night time. If in a box it should not have a wooden floor but dry sand or litter, and be cleaned out every day. Also see that the red mite is not in the woodwork, and be sure that they are not crowded in a small box, in which the air becomes too hot and evil smelling, neither need there be any hurry in compelling them to take to the perches, they will, as a rule, take to the roost on their own account.

On the farm chicken-raising can be easier managed than by the ordinary town or suburban raiser, especially if they have access to the manure heap, they do wonderfully well under such conditions, but care must of course be taken to see that they do not get in the way of the horses or get knocked about by the adult fowls.

The ordinary farmer will probably say that all these directions and instructions make too much work and trouble, and that it would not pay to put in so much time over fowls. It certainly would not pay the farmer himself to look after the chickens and neglect ploughing, clearing, reaping, etc., but for one of the younger members of the household to take this branch of the farm work in hand it would pay, and pay very well too, or better still, say two of them, a son and a daughter. The lad could do the rough carpentering, cleaning out, and any of the hard work which may occur, and the girl would attend to the chicken-raising, feeding, etc. But to effectually get them to take the lively interest in the work necessary for success, it is advisable to give them a pecuniary interest in the fowls, and a good way of working it would be to give them a bonus of, say, 6d. per head for every chicken raised up to six months old, and a per centage on the net proceeds of all sales of 2½ or 5 per cent. Under this arrangement the farmer finds the fowls, appliances, and feed; he also takes the profits, less the commissions and bonus already defined.

CALF REARING.

By R. E. WEIR, M.R.C.V.S.

Before commencing to treat on the various diseases to which calves are subject, I purpose dealing with the methods of rearing these animals, more especially as applied to our local conditions.

Until recently the various dairymen within this State have not been in the position to give this industry the attention which it justifies, for the reason that their supplies of milk were limited; then again, paddocking accommodation for young stock was difficult

to procure. This, however, is now being remedied, and for the future a large number of hand-reared stock will be found growing up to take the place of the dairy cattle at present in use.

To insure success in this direction, careful attention must be devoted to the selection of the best heifer calves from amongst the most suitable cows. By these means and the choosing of good sires, the results should show steady improvement towards the attainment of perfection.

Some difference of opinion exists as to the best time to begin hand feeding, but undoubtedly the wisest plan is to have the calf removed as soon as it is dropped, for should it be permitted to suck the mother, a tendency would thus be produced to make both mother and young restless, and the habit once acquired is seldom forgotten, and in after life it is not uncommon to find well advanced heifers sucking the other cows of the herd.

When the udder is congested, however (as frequently occurs with young heifers), relief is more speedily afforded by allowing the calf to suck for a few days after calving. It must not be forgotten that the first milk from the mother should always be given to the calf and not the milk from some other cow. The first milk (or colostrum) given by a cow is especially suited to the requirements of a young calf, as it contains the properties to act as a mild aperient, and a stimulant to the digestive organs. Under natural conditions the calf takes its milk frequently and in small quantities, and any excessive amount results in indigestion and diarrhœa.

For the first month two or three quarts of new milk daily are a sufficient allowance, and the calf should be fed at least night and morning. At the termination of this period skim milk may be gradually substituted for new, and the quantity increased, but this must be given warm, and on no account should the food be given cold until the weaning is practically over. The addition of a small supply of well-boiled linseed or barley meal to the food at this time will hasten development.

When the calves begin to nibble a little fresh hay should be given, and at the age of about two months, if the grass is well forward, they can be turned loose in a small paddock, although at the same time the linseed or meal diet will have to be continued for a longer period.

Proper housing is very essential during the period of hand rearing. Warmth must be combined with ample ventilation, and a clean litter requires to be supplied at least twice weekly, and the place kept free from any deleterious smells. By this means—the animal having been brought up under favourable conditions—healthy development will result.

The common practice of tying calves to stakes in the ground, as also housing in the darkest corner of a building where foul air accumulates, is to be avoided, as it is impossible that satisfactory progress can be made under those conditions.

It is advisable to have each calf housed separately during the period of raising, as by this means they will become easily educated for future handling, and the difficulty attached to feeding when running loose is avoided.

Careful attention is necessary to keeping the feeding utensils in a perfectly clean condition. This should be attended to immediately after use, so as to avoid the possibilty of the food supply becoming tainted. The digestive organs of young animals are very sensitive at this age, and unless the food is given in a thoroughly wholesome condition, and at about the same temperature as supplied by the parent, there is far more likelihood of disease occurring than if attention is given to the observance of these precepts.

(To be continued.)

STRAWBERRY CULTURE AT KALAMUNDA.

By G. WHITTINGTON.

Mr. G. Whittington, while on an inspection of the orchards situated in the Upper Darling Ranges, also visited a number of strawberry plantations, and, on his return, reported as under. As Mr. Whittington has had in England practical experience of strawberry culture, his remarks should prove the more interesting:—

"On arriving at Kalamunda, Mr. Lancaster and I started on our round of inspection. I was agreeably surprised to find so many of the growers so well up in the cultivation of the strawberry; in fact most of them have already grasped the great essential—clean cultivation. One and all seemed pleased to see us, but did not spare me in the number and variety of questions they asked: How can I get rid of a small beetle that pierces the fruit trusses and destroys so much fruit? What is the best manure? What are the best sorts? What is the best soil? etc. My answer to these and other questions I will state later on. During my inspection I was surprised at the many different soils in some fields. In patches of an acre I found plants doing equally well in stiff clay, chocolate loam, black peat, and sandy soils. I was rather disappointed to find, in most cases, that the "Sir Joseph Paxton" plants did not do nearly so well as anticipated, it being one of the strongest, most prolific, and remunerative berries grown in Europe. It should be persevered with, as I feel sure it will succeed in good loam with plenty of farmyard manure. Another variety that has not up to the present been successful is the "Noble," which I expected would

have made a name for itself as a strong grower and great bearer; it is more adapted to a dry climate than many others, its fruit being of much better flavour in a dry season than a moist one. The variety which appears to be most adapted to the district is the "Edith Cristy," which in all cases had a good quantity of fruit showing; it is early in all soils but more so in the lighter ones, and especially so on a north-east slope. This berry, although the best cropper in this district at present, does not by any means command the same price as the "Paxtons." "The Eleanor," a late variety much grown in the South of England would, I think, do well in the district as a late cropper; it stands drought well, giving very large berries, and is very prolific. The "Sharpless," an American variety, is doing very well at present but there is not a large quantity in cultivation yet. Most sorts were showing traces of leaf blight; plenty of well-rotted stable manure would produce strong healthy plants which would be less liable to the attacks of the disease. With regard to checking leaf blight, the best method is, at the end of the season, to trim off all the leaves with a fag-hook, not cutting too close to the crowns, rake them up and burn them; by so doing the homes of many pests are destroyed at the same time and the fungus disease is checked; in early spring spray with a weak solution of Bordeaux mixture. With regard to the beetle pest I advised sinking any kind of tin, such as meat or jam tins, etc., in the ground in the rows, the tops on a level with the surface, half filling the tins with water sweetened with sugar, honey, or treacle. The beetles at night are attracted by the smell, and finally find a resting place in its seductive sweetness. In the morning the tins should be visited and the beetles taken out and burnt. If this plan is followed out I think there will be very few beetles left to worry the grower. I have often found a tin half filled with beetles in one night. Another pest—which I am pleased is not so prevalent here as in some other parts—is the larvæ of the cockchafer. This is a whitish grub with a brown head and *black tail end.* It works under the ground, and eats off the young roots of the plant; then burrows away to repeat the same process to the next plant in the row. I have known it to continue its way right up the row, destroying every plant on its journey. After the plant has been visited by this pest it will droop down directly the sun throws its warmth upon it. Growers seeing this should pull it up and stir the ground until he finds the grub, destroy it, and so minimise further trouble. These, I think, are the principal pests and diseases that growers have to guard against. I found in a few cases young beginners lacked the first principal of strawberry growing. When a piece of land is cleared, with the intention of growing strawberries, the land should be either fallowed or manured, and a crop of potatoes taken off before the strawberries are planted. In all cases land should be deeply cultivated, and good laid down plants used. Starting to make a fresh plantation, the first three runners shooting from three year old stock should be laid down between the rows, and small pieces of stone placed upon them to keep them in position. If the soil is loose and moist the young plant will soon take root. As

soon as the young plant has developed a few leaves the runner proceeding from it should be pinched off, and all other runners separated from the parent plants. At the end of the season the young plants are severed from the parent, and taken up and planted out. By so doing strong-hearted plants are obtained, and pay well for the trouble taken. The new bed should be planted 18 in the rows, and two to two and a-half feet from row to row. The plants should be kept clean from runners and weeds. As regards manures, I have always found that droppings from corn-fed horses give the best results. Peruvian guano, bone and blood manure, and just before the fruit has set, a light dressing of nitrate of soda, being careful not to let any fall on the plants, as it will burn them. There is another style of cultivating the strawberry, which is carried on in America. That is to let all the runners grow, but to keep them in the rows, not allowing them to spread out into the ally way between the rows. This is in large fields, where horses are used to cultivate.

BEE NOTES.

TRANSFERRING.

First get everything ready—a hammer and chisel, a ball of cotton cord, a case knife or a knife with a long blade, and a box, say about a foot deep that will just fit on top of the box you wish to transfer when the top is taken off. Next you want a table or smooth board to lay the combs on when they are taken from the box hive later on.

Now go to the box you wish to transfer. If it has a cap on it, take it off and set it aside. If it has no cap, then knock the top off and place the box previously mentioned on top—the open side, or end, down, of course. Now, with a couple of sticks, drum the box hive for about ten minutes; after this, set it a few feet to one side and place your patent or modern box in its place. Now drum the box hive again for a few minutes and then lift the box from the top and you will find it full of bees. Dump these at the entrance of your modern hive, and watch carefully to see if the queen is among them. If you do not see her, replace the box and drum as before, until you have at least taken most of the bees from the box hive. Now, with hammer and chisel, pry off one side of the box hive with your knife, cut the combs from the box and lay them on the table. Take a brood frame from the honeymaker or modern box, place over one of the best combs, and cut the comb, following the inside of frame. Fit it in as nicely as you can, taking care that

you place it in the frame as it hung in the box—the end that was up in the box must be up in the frame, as the cells in the comb slant downward. If reversed, the bees could do nothing with it. Sometimes it will take two or more pieces to fill a frame. After you have filled frame the best you can, do not lift it up, but slide it gently to the end of the table—now a little more, so the frame will project a couple of inches beyond the edge of the table. Now, with the cord, wind around the frame and comb twice and tie tight; next slide the frame to the other end of the table and tie the other end as you did this. Now that you have the comb tied sufficiently in place, raise it up and place in your modern box. Repeat this operation until you have used up all the comb containing brood and honey that can be used. Now put the top on your modern hive and shake all the bees that remain in the old box at the entrance and your job will be finished.

Don't put super containing honey boxes on your transferred colony under a week or ten days, and not then unless they are well built up in the brood chamber and honey is coming in.

If you wish to Italianize them, wait until about ten days after they are transferred, then hunt up the queen and kill her. In about three days look the frames over carefully and cut out all queen cells that may have been started. Now take the cage containing the new queen, take the cork or stopper out end of cage containing candy or feed and place cage, candy end down, between a couple of frames near the centre of the box; then put top on and do not open again for a week. By this time the bees will have liberated the queen, and you can take the cage out and shove the frames back close. As the life of the worker bees is only about twenty-one days, or a month, you may be sure to find your box pretty well Italianized by the end of this time, as it takes just twenty-one days from the time the egg is laid to hatch out a full-fledged bee. You should order your Italian queen several days before you kill your old queen, as queens cannot always be furnished by return mail. Queen-breeding is a slow and tedious process, which is not always understood by those not engaged in the business. You may have some fine queens to-day that you intend selling in a few days. They go out on their "wedding trip" and do not always return. Some that do return get into the wrong box and are killed, while others are caught by birds.—*Exchange.*

THE GROWTH OF THE GRUB.

There is a very important distinction between the two great classes of food materials found in all kinds of plants and animals. The one class, known as "flesh formers," contain nitrogen, and constitute more than half the weight of the animal. The other class, known as the "heat producers," consists merely of carbon and the elements of water, and are represented by fat in animals and sugar in plants. The flesh formers compose the working parts of the animal body; the heat producers are the fuel which keeps

them working. Both classes of food material come originally from the plant, but while sugar is common and cheap, the flesh formers are scarce and expensive. In the plant, as its growth reaches maturity, we find that the flesh formers become concentrated in the seed, and it is this fact which explains the value of these parts as food for animals. The pod-bearing plants, peas, beans, clover, and lucerne, are noted for the high percentage of nitrogen that they contain. Herbivorous animals have to digest large quantities of vegetable food in order to obtain the necessary amount of nitrogen, while carnivorous animals make use of that which is concentrated in the flesh of those which they eat. Thus the struggle for existence is to a great extent simply a struggle for nitrogen.

Now insects, like all other animals, require a full supply of flesh formers, because their muscles and other parts are exceedingly active. But they differ from the higher animals in the fact that there is no provision made for the maintenance of the working tissues as they wear out. The supply, to last the whole life of the animal, is elaborated while the insect is in the larval stage. Hence the insect resorts to all kinds of devices in order to secure a full supply of nitrogen for the grub. Let us take a few examples. Some grubs, as ordinary caterpillars, are very voracious, and obtain the full supply of flesh formers by working over enormous amounts of vegetable food in proportion to their own weight. Other insects, as the codlin moth, lay their eggs so that the grub gets to the core of the fruit near the seed, where the nitrogen is concentrated. Others, as the ichneumon flies, lay their eggs in the bodies of other insects, so as to make use of the material they have painfully collected. Others, as the blow fly, place the grubs in highly nitrogenous material, such as flesh, while the adult animal lives on sugar. In the case of the bee, the larvæ are fed on pollen, which is the most highly nitrogenous material the bee can find in the flower. Nectar and honey contain little except sugar. Hence a full supply of pollen is essential to the due nutrition of the larvæ. From examinations recently carried out there is no doubt that pollen varies considerably in its chemical composition. Possibly in periods of drought the eucalypts do not produce so much or so rich pollen as at other seasons. From the great quantity of nitrogen in the seeds of wattles, clover, and lucerne, there is little doubt but that the pollen of these plants is extra rich in that constituent, and that perhaps explains why they are favourites with beekeepers. Any artificial food supplied to bees should be well supplied with nitrogen. What he wished to emphasise was the fact that healthy bees can only be reared on food that contains a proper amount of this all important element. The growing tissues of the larval bee cannot be built up from honey and sugar alone.—*Exchange.*

INTRODUCING IMPROVED QUEENS.

As poultrymen have to replace their cockerels every year or wo in order to introduce new blood, and keep their stock from

degenerating, just as important is it for the bee-keeper to introduce new blood into his bees and keep up the vigour and energy of his stock. Instead of exchanging the males, as with poultry, the bee-keeper should exchange the female, by introducing a young queen from some locality or State.

Breeders generally send out two kinds of queens, tested and untested. A tested queen is one that is kept laying in the hive for several weeks until her progeny appear. If they are evenly marked like the mother, the queen has been purely mated. We will assume that the bee-keeper has sent for a queen. Upon her arrival and before introducing her to a colony of bees, the colony first must be made queenless. Open the hive and take out one frame after another, looking them over carefully, until you find the queen; after removing her from the comb, close the hive and let it remain so until the next day. In the meantime the bees will have missed their queen and become frantic, and will run up and down the front of the hive. In twenty-four hours after removing the old queen the new queen may be introduced by placing the cage on top of the brood frames, wire side down, so the bees in the hive can become acquainted with her. It will take the bees three or four days to eat out the candy in the end of the cage and liberate their new mother. By this time she has become the same scent as the bees in the hive, and they will no doubt take to her kindly, and in a day or two she may be expected to commence laying. We will suppose that the queen removed was a black one, and the new queen which has been introduced is a yellow one, more commonly called Italian. In twenty-one days after the removal of the black queen all her brood will have emerged from the cells, and seven weeks later not a black bee will be seen in the hive, as the life of a honey-bee is but forty-five days. In winter, when inactive, they will live several months. In four weeks after the new queen has been introduced, you will see yellow bees playing about the entrance of the hive, and they will become more plentiful each day, while the blacks will diminish.

In two months you will have an entire colony of yellow bees. The next generation of queens will no doubt cross with the other drones in the yard and bring forth hybrid bees. "With me," the writer says, "hybrids have always proved the best hustlers in the yard, gathering more honey than either blacks or Italians. They seem to inherit the wintering qualities of the blacks and the working energy of the Italians, and cap their honey nicely without any watery appearance, which is so prevalent with Italians. Furthermore, they are not given so much to swarming. They seem to stand the rigour of winter as well as the black. They also build up very fast in the spring and are ready for the honey flow when it comes."

THE ANGORA IN QUEENSLAND.

In his report on the live stock of the State of Queensland, Mr. Thornhill Weedon, the Government statistician, has the following:—"In accordance with the intention expressed in the last report, circulars and forms were posted to all breeders of Angora goats whose addresses could be ascertained. Although some of them have not vouchsafed any reply, the tenor of those received points to a probable expansion of the industry, and the following remarks are collated from the replies: Several owners who started with crossbred sires express the desire of obtaining pure-bred ones, and seek information as to where they are obtainable. Climatic variation seems the principal cause of success or failure. The northern coastal districts, owing to excess of moisture, seem ill-adapted to their success; in the dry climate of Hughenden, on the other hand, they thrive well, and, as a food product, are stated to be excellent, and equal to the finest lamb. More attention has apparently up to the present been given to breeding for meat and milk than for mohair; for the latter purpose, grading up from the common or crossbred doe with a pure-bred buck, results in a good commercial produce after the second or third cross; that is, three-quarters or seven-eighths pure-bred. As the breed becomes purer, the fecundity and milk yield decrease. As clearers of scrub land they are specially valuable. One breeder says:—'I note they eat nearly all the bushes, even sprouts of eucalyptus and coolibah. When we first came here there was a scrub of sandalwood adjacent; there is no scrub now, and the goats cleared it.' If yarded at night, herding is not necessary, unless wild dogs are numerous. In this case, protection may be afforded by rearing a dog of suitable breed in the goat-yard, suckled from the birth on goats. It would accompany the goats all day and return with them at night and defend them if attacked. The skins are a valuable asset, as prices realised ranged from 1s. 6d. to 5s. 6d. each. Although little attention has hitherto been given to the production of mohair, several owners express the intention of shearing this year. The only reply received on this point states that 6½d. per lb. was obtained in Sydney, and this was from pure-bred goats; the wethers sold for killing averaged 40lb. each, and this at barely two years old."

The Government of the State are determined to encourage this industry, and the Agent-General is now making inquiries as to the London values for mohair.

TRAP NESTS.

CONTRIVANCES FOR DISCOVERING THE HENS WHICH LAY.

Most trap nests have two compartments, and can only be used in that form. That involves large size, and also a particular manner of placing the nest that may not be, and usually is not, easily practicable in a small house as a poultry-house commonly is and properly should be. As eight nests are about right for 25 layers, it is quite a problem to place them, if of two compartments, in most poultry-houses, and most such nests require to be placed in a particular way that makes the problem unsolvable. Most trap nests have some feature in the trapping that is likely to scare the birds and cause them to avoid the nests. Many trap nests are distinctly uninviting to the fowls, so they will lay anywhere but in the nests; many trap nests are hit-or-miss as to recording. Some of them permit a hen to get out and another to get in, which impairs all records.

To my mind the specification of a good trap nest for general use is about like this: It must be no larger than any ordinary box nest that has bottom, back, sides, and top boards. It must be such as may be placed either facing into house or facing wall of house. It must be such as may be carried on brackets above floor, or resting on floor or ground. Eight of them or more should be easily put in a suitable place without putting them in tiers. The trap arrangement should be about noiseless, the nest ventilated; trapping should always be effective, and nothing about the nest should be unattractive to the fowls, and nothing to scare them.

Wellcome's Ideal reasonably fills this specification. It is nothing but an ingenious form of opening in a door that permits a fowl to see into and get into a semi-dark place nicely prepared for her to deposit her precious egg. As soon as one hen has entered, the trap operates almost noiselessly and without shock, merely partially closing the opening so that the hen cannot leave nor another enter.

There is just one thing it cannot do, and it should not be expected. That is, the same nest will not do for a bird of Leghorn size and another of Brahma size. But then, for other reasons, anyone keeping fowls of great difference in size in same lot is a long way from proper poultry keeping; and Ideal nests can be made to suit all sizes if the sizes are kept in different houses. The Ideal can be made to stand facing into house or facing wall, or on brackets or on floor, or in tiers if that suits you.

Eight nests for 25 layers will do very well. They should be visited four times per day. You simply open door, take out hen,

read number of her leg band, mark that and date on egg, then reset trap and close door. Before opening you can see whether a hen has done her laying or not, so you need not disturb her if unnecessary. There should be none other than Ideal nests in the house. Then the birds will learn to enter them speedily, and will like them if you handle the birds gently and quietly when removing. Very few or no eggs are likely to be laid outside the nests if you are reasonably careful about your actions. When this article is finished I will attempt to show you why you should always be gentle with fowls.

While all I have heretofore told about poultry and all I can hereafter tell, has been, in a sense, made possible through identification of layers, my aim, in this article, is to exploit many details essential to proper knowledge of fowls and good results from their maintenance, that are attainable to any poultry keeper who will cultivate the acquaintance of the hen that lays the egg. Let me just say here that if poultry keeping is your business you ought to do it up to the handle, and you cannot do it up to the handle by knowing that so many birds lay so many eggs. There seems to be no end to what one can learn from knowing the layer of each egg. Perhaps to tell it will seem to savor of romance. Told in other ways it has been said to be romance, theory, moonshine, and what not. Try the game yourself, test what is to be said, then we shall reach something sometime, which is the dire necessity of poultrydom.—*Exchange.*

SUPPLY POULTRY FOR MARKET.

It is satisfactory to learn that poultry keepers in Queensland are about to respond to the efforts of the Minister for Agriculture for that State to assist the poultry producing industry. The establishment of an association or club is what is needed to organise the business, and those gentlemen who held an initiatory meeting the other Saturday evening seem to be acting sensibly and practically in the matter. They have two objects in contemplation—one the production of pure-bred stock, the other the supplying of the market with poultry fit for export. The first of these is essential to the success of the latter. The time has passed when any sort of mongrel fowl will satisfy the demands of purchasers. Poultry-breeding is becoming a great industry in European countries—it has long been so in the United States—and the greatest market is to be found in the United Kingdom. Thither birds from European countries—and notably Russia—are being sent and are securing a

freer sale and better prices than Australian poultry. Matters must be mended so far as our producers are concerned, and the first step towards doing so is the multiplication of pure-bred birds. The term fancy fowls must be discarded, because birds cannot be kept merely to look at. Handsome is as handsome does must be recognised as the chief merit of the helpful hen. But the claims of each sort can only be ascertained by breeders who have hitherto been called fanciers, but whom it would be more just to designate poultry experts and scientists. We have many of them in our community, and it is well they should be countenanced and encouraged in pursuing the methods which have been found interesting and useful in maintaining the excellence of strains and purity of breeds. They put it within easy reach of farmers to produce excellent birds without being at the trouble and worry of attending to the details to be observed in producing such fowls. Then organised effort will be needed to create the export trade in which the Minister for Agriculture is evincing so much interest. His scheme is similar to those which have been found so successful in operation in Victoria and New Zealand. In the island colony numerous stations have been appointed at the seaports to which farmers can send fowls for export. The birds must be of good kinds, and weigh: Pullets, $3\frac{1}{2}$lb. each; cockerels, 4lb. As they are received at the depôts the birds are killed in the most approved manner, carefully plucked, prepared, and packed for export; they are sent abroad in chilled chambers, marketed, and sold to the best advantage. Subject to the deduction of the cost of preparation and carriage the proceeds are handed over to the producers. Victoria did well out of the business at one time, but producers became careless and allowed the Russians and others to cut into the trade. Efforts are now being made to regain the lost position, and the other day a crate of Russian fowls was landed at Melbourne for the edification and instruction of producers in the Southern State. The lines on which Mr. Denham proposes the export trade should be established in Queensland are similar to those which have been found profitable elsewhere and may be made so here by the organised efforts of our producers. The fact that cold storage will be available on easy terms in Rockhampton should warrant the Government in forming a receiving station here. Crates of birds made up ready for export may be kept till convenient shipping facilities are available.—*Capricornia.*

Excess of salt is not good for fowls; but a little salt, as, for instance, in their food, is beneficial.

There ought always to be a shallow box full of dry dust in every poultry house, and it should be often renewed. A constant and never failing dust bath is the very best remedy for lice.

SPECIAL PRODUCTS OF THE FARM.

Compiled by the EDITOR.

(Continued).

EGYPTIAN, OR PEARL MILLET (*Penicillaria spicata*).—A very productive and useful forage plant, which has been grown in the driest districts with great success. It is a strong grower, and yields a great amount of green fodder. When the plant first comes up the stems are prostrate, but assume an upright position when two feet long. Stock eat it with great avidity. It can be cut three or four times, sprouting readily, and growing rapidly after each cutting. It should be sown in drills, dropping two or three seeds two feet apart in the drill; the drills should be three feet apart. Four pounds required to sow an acre. The writer has cultivated this plant for the past six years and has found it to be one of the most valuable and drought-resisting fodder plants ever introduced to his notice. It, like all plants, flourishes best in rich soils, but will give a profitable return in poor soils and really under the most disadvantageous circumstances, and stock eat it readily in all stages of its growth.

NEW DAKOTA MILLET.—This new American variety, according to Mr. William Adamson's catalogue, has proved itself, in experiments, to be an immense yielder. It was tried at the Ontario Agricultural College, with 12 other varieties, and yielded a crop averaging 8½ tons to the acre, being far ahead of all the other varieties, excepting the "Pearl." It is a very strong grower, producing an immense amount of foliage, stands the hot, dry weather well, and makes excellent hay, which is greatly liked by cattle. It was tried last season in New South Wales by the Agricultural Department, and gave every satisfaction. Sow in drills, three feet apart, about four to six lbs. to the acre, or 10lbs. broadcast.

CHICORY.—The culture of this root should not be attempted unless the soil is of first-class quality, otherwise the expense of preparing the soil, keeping it clean, and digging and harvesting the crop would exceed its value. The soil should be prepared as for carrots, and the seed dropped at intervals of nine inches in shallow drills eighteen or twenty inches apart. The end of September and beginning of October is the best time to put in the seed. The young plants should be carefully singled as soon as large enough to handle, and the soil must be regularly cultivated throughout the season. Four pounds required to sow an acre in drills. There is a limited demand in this colony for the root, which is used in a dried state for adulterating coffee.

LINSEED, OR FLAX.—This should be a profitable crop to grow in the Blackwood and South-Western districts, where the soil is rich and rainfall plentiful, and one to which farmers should pay attention. It is not only valuable on account of the seed, but for the fibre, which is worth about £40 per ton. The seed should be sown broadcast on well-worked soil, and either very lightly harrowed in, or both harrowed and rolled, according to the condition of the soil; but it requires in every instance to lie very near the surface, for if deposited more than half-an-inch deep it will not germinate. It succeeds well in the Gippsland (Vic.) district, and should be sown very early in the spring or autumn at the rate of 1½ bushels (56 lbs.) for seed, and 2 to 2½ bushels for cordage purposes.

BROOM CORN.—Is a variety of sorghum, and should succeed well in this colony. In addition to its well-known commercial value for supplying the fibre for broom-making, it has to a large extent the nutritive properties of the sorghum tribe, and thus forms a useful fodder plant. The seed yield, too, is heavy, and is capital food for poultry. The seed heads (stripped, of course, of the seed) give the fibre for making the well-known American house broom, dandy brushes, clothes dusters, etc. Its value depends on its length and toughness, and these in turn depend on a proper selection of seed and method of curing. It requires similar soil and culture to corn, and the ground should be in good condition. It is frequently planted in drills three and a-half feet apart, leaving the plants six inches apart. September to November is the best time to sow the seed. The varieties now in the market are:—Californian golden long-brush, growing from twelve to fourteen feet high. Improved dwarf, an excellent variety, growing a fine brush of good length. Long-brush evergreen—this variety grows about eight to ten feet high, stands up well, and is entirely free from crooked brush. The fibre is long and fine. This is a strictly green variety, and does not get red in the field before it is cut.

FIELD CABBAGE.—Field cabbage may be cultivated either by raising the young plants in a seed-bed and then transplanting them, or by sowing the seed in drills where the crop is to go, and thinning out the young plants. The rows should be three feet apart and the plants 18 inches apart in the rows. One pound of seed will provide enough plants for an acre when sown in the seed-bed. From four to six pounds will be required for drilling. Grant drumhead and Schweinfurt (a very early white variety) are the favourite sorts of field cabbage.

THOUSAND-HEADED KALE.—This plant—a tall, branching variety of cabbage—is, in the opinion of the writer (founded upon ten years' experience), one of the most valuable fodder plants ever introduced into Australia. It produces more weight of fodder per acre than any other known plant, it is relished by all stock, and may be fed safely at all seasons of the year. It will withstand drought to an extraordinary degree, the writer having secured a crop of 27 tons (weighed) from one measured acre in this colony in

one of the driest localities, the rainfall from the time the plants were put out until the crop was harvested being only $3\frac{1}{2}$ inches. The plant, being a deep sucker, does not impoverish the land, but, on the contrary, does it good, bringing up fresh stores of plant food to the surface for the subsequent use of shallower rooting crops. The plants will last for two and sometimes three years if not allowed to go to seed. Three pickings will yield from 35 to 45 tons of green fodder per acre. Sowing and treatment same as for cabbage. The Jersey tree kale is another and very similar variety. In reference to thousand-headed kale, a recent writer in the *Agricultural Gazette* (London) says: "A few days ago I was over the farm of a friend who farms extensively, as he has recently added another 1,000-acre farm to a previous occupation of the same extent, making upwards of 2000 acres in his holding, and what impressed me was the quantity of thousand-head cabbage on the farms. All the sheep, comprising about 1,500 breeding ewes and 400 tegs, were feeding more or less on this crop, and doing well on it. On my remarking on this fact, he said, 'I have given up growing swedes, as it is a most expensive and uncertain crop to grow; moreover, the difficulty of obtaining hoers when required in haying and harvest is very great. I therefore now grow thousand-head cabbage in place of them. I drill them in May; when they get high enough I run the harrows across the rows, and skim them about twice, and that is all the labour required.' Now contrast this with the swede crop, the uncertainty of getting plants, and all the labour of getting them set out and just at the right time. Moreover, the swede crop is very liable to total destruction from a hard frost, whereas the thousand-head cares nothing for frost; and I knew a neighbour two winters ago, when the severe frost killed everything else, sell three acres of this crop for £50 per acre for greens. I therefore think sheep farmers in many cases would do well to reduce their swedes and replace with thousand-heads, which come in in this country (Great Britain) from about November up till the end of March." A New South Wales farmer writing about thousand-headed kale says:—"Thousand-headed kale is the least known and most desirable of any green crop I have ever seen. It is a plant that produces more feed per acre than any other, does not disagree with any stock, and does not impoverish the land. With me it has never caused sheep or lambs to blow or scour. Eighteen perches per day, with a little oat straw, have kept 270 sheep for three months without the loss of one."

HEMP.—This plant is cultivated with success in the Gippsland district of Victoria, and should do well in the Blackwood country of this State. It likes rich, moist bottom land, but will grow fairly well in poor soils. It should be sown in drills in autumn or spring so as to produce a more robust fibre. In its raw state hemp is worth about £43 per ton in Melbourne. 120 pounds seed to the acre, broadcast; half the amount in drills.

OPIUM POPPY.—This plant might be profitable cultivated where children are available for labour on the farm. The seed should be

sown in drills three feet apart, and the ground must be kept well cultivated. August and September are the best months for sowing.

WHITE MUSTARD.—In some countries mustard is a profitable field crop; and when the value of rotation of crops is fully recognised, will probably come into cultivation here also. The land requires to be well worked, and the crop will pay for a considerable application of manure. The seed may be sown broadcast, or in drills eighteen or twenty inches apart, for the sake of cleaning the land, in the end of September or the beginning of October. The seed ripens in three months or less, so that it may be made available as a fallow crop. The crop should be harvested before any of the pods burst, as if seeds are scattered they foul the land to a serious extent. It may be covered effectually by rolling without the use of the harrow. A yield of 20 to 40 bushels of seed to the acre may be expected. It is very useful for sheep food. Eight to ten pounds required to sow an acre.

PUMPKINS AND PIG MELONS.—The pumpkin is a field crop not to be despised. It likes rich and preferably new land; seeds should be sown in hills as soon as the ground begins to get warm. Mulching in the late spring is a decided help. Pig or "paddy" melons are a valuable standby. Seeds may be sown in any waste corner, new ground preferably, and no cultivation or attention is needed. The melons, chopped up, with a little bran and chaff added, make a diet much relished by cows. Pigs do well on the melons.

SUNFLOWER.—This plant should be grown freely where poultry are kept, as the seeds are much relished by fowls. A valuable oil is also extracted from the seeds. When grown in quantities it would be profitable to express the oil and use the marc as food for stock. The stalks, which contain a large percentage of potash, are used in Russia for fuel. The large Russian variety is the best, and seeds should be sown in spring, in drills about three feet apart.

THE SUGAR BEET.—The profitable cultivation of the sugar beet on a large scale is chiefly governed by the cost of labour. The following, prepared by Mr. A. Despeissis, of the Bureau of Agriculture, gives the necessary information as to culture:—

VARIETIES.

1. *White improved Vilmorin Sugar Beet.*—Originally obtained from the white Silesian beet, and of the result of methodic and persevering selection, one of the richest and most regular varieties in existence. The yield is about 12 tons per acre, with a proportion of sugar in the roots amounting to 16 per cent.,* representing 1 ton 10cwt. of extracted sugar per acre.

As regards its preservation, it is recognised that it holds its sugar content better than any other variety, and for that reason, in those factories in which the "Improved Vilmorin" is manufactured in connection with other varieties, it is the custom to keep this for the end of the season and to work up the less reliable beets soon

after they have been pulled. It is also claimed to resist better than any other variety the unfavourable influence of certain soils, such as black soils, rich in organic matter, and of certain manures, while most other varieties under these circumstances become watery and saline in excess, thus seriously deteriorating the quantity as well as the quality of the sugar and checking its extraction.

This variety is very extensively grown where the excise tax is paid on the beet itself and not on the manufactured sugar.

2. *Green-top Brabant sugar beet.*—The top, which protrudes from the earth about a couple of inches, is coloured green, and carries a foliage vigorous in growth and upright in position. The root is long, smooth and white. It is a very prolific and vigorous variety; requires deep soil, well tilled; the weight of the crop averaging 20 tons per acre, containing about 12 per cent. of sugar, representing about 1 ton 5 cwt. of extracted sugar to the acre.

3. *French rich sugar beet.*—A variation of the Brabant beet, preserving in its general aspect, and notably in its foliage, many of the characteristics of the Brabant. It differs distinctly from it in the fact that it grows entirely under the soil, is more slender, with a more reddish skin and more compact flesh. Its yield averages 16 tons of roots per acre, containing 14 per cent. of sugar, which represents 1 ton 12 cwt. of extractable sugar.

4. *White red-top sugar beet.*—Is about equal to Brabant green-top in yield and percentage of sugar, but it does not require such deep soil, and ripens earlier. It is very extensively grown in countries where the tax is paid on the manufactured sugar or on the alcohol and not on the roots.

5. *Early red-skin sugar beet.*—Is a very good and distinct kind, growing entirely under ground, with leaves lying flat on the soil. It yields about 16 tons to the acre, containing 14 per cent. of sugar, or 1 ton 12 cwt. of extractable sugar. It ripens early and keeps well.

6. *Klein-Wanzleben sugar beet.*—Has a wider cultivation than any other sugar beet. The root is conical, straight and even, quite large at the head, and rapidly tapering. It has a brighter colour than the improved Vilmorin, which enters largely in the cross from which it comes; its leaves are lighter coloured, undulating, and scalloped about the edges. This variety succeeds well in soil of an alluvial nature and mean richness and on level plateaux. In soils very rich in humus it ripens poorly and loses much of its richness. It yields slightly heavier crops than the improved Vilmorin, but its Saccharine richness does not exceed 14 per cent.

* N.B.—About three-quarters only of the sugar in the roots can be extracted and crystallised, and the same applies proportionately to the other kinds.

(*To be continued*).

ANNUAL REPORT.

Department of Agriculture.

Honourable Minister for Lands.

SIR,—I have the honour to submit my first Annual Report, for the year ending 30th June, 1904.

The season has been a good one for the country generally; the wheat yield was good, and varied from 17·72 bushels in the York District to six bushels in the Phillips River, the average for the whole State being 13·9 bushels. The total yield—1,899,550 bushels—being an increase of 928,979 bushels over the previous year; and even this might have been considerably augmented if the use of artificial manures were more generally gone in for. Each year is seeing more farmers recognising the value of artificial fertilisers, but there are still a great number who do not. The arrangements made for lectures in the principal agricultural centres this coming season should be the means of converting many of the non-believers.

While the season, generally speaking, was a good one, the settlers along the Great Southern line suffered from too much rain, and the average yield there was reduced, probably, by at least six bushels to the acre.

Potato-growing is still going steadily ahead, but we still import a large quantity from the East, although our own lands are capable of producing far more than ever should be required for local consumption, and of the finest quality. The probable reason why more potatoes are not grown is that more labour is required than in cereal or hay-growing; and, whether it is from the difficulty of getting the right kind of labour, or the high wages that have to be paid, I notice that the farmers here carefully avoid all kinds of farm work that entail the engaging of outside labour.

I am pleased to be able to report that many farmers are at the present time turning their attention to sheep-farming in conjunction with their other agricultural work, and I think we are now within measurable distance of the time when the South-West Division will supply all the mutton that is required.

Dairying still remains almost at a standstill, although those that are in the business have been greatly improving the quality of their stock by means of the introduction of good bulls; the general quality of the dairy stock in this State is very high. So long as good prices are obtainable for wheat, oats, and hay (that require comparatively little labour), dairying, with its attendant long hours and seven days a week work, is not likely to advance much; but once our local production of cereals is equal to the demand,

and prices are on a par with the rest of Australasia, farmers will be forced into dairying and other agricultural pursuits that are now neglected, if they wish to keep their incomes up to what they were before.

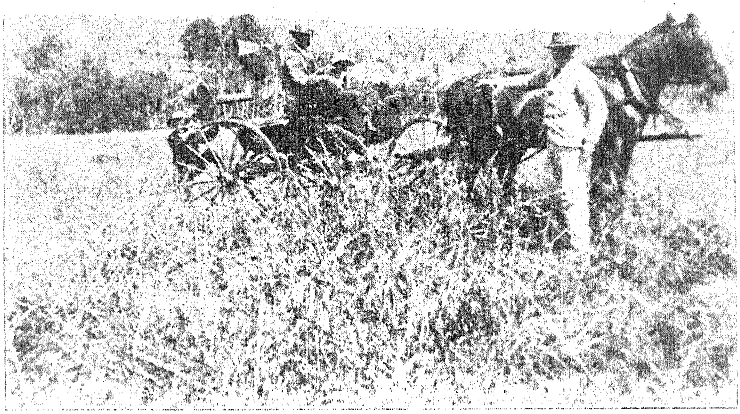
We still continue to import an enormous quantity of ham and bacon, and for all practical purposes we are non-producers. This is an industry that might well be gone in for, as it is a most remunerative one, and once there is a supply of pigs on the market, there will be no difficulty whatever about getting curing establishments erected, as I have been approached by two of the leading manufacturers of the Eastern States, asking for information as to whether it would pay to start manufacturing here. I regret I had to reply that we had not the supply of pigs at present to warrant such an undertaking.

Poultry is another industry that does not receive anything like the attention that it should. There have been a good many poultry farms started, but in most cases they have not been successful, mainly due to the lack of experience of the would-be farmers. For some reason or other, people who have failed at all other things often take to poultry farming as a last resource, and the idea seems to be that almost anyone can run a poultry farm successfully, whether they have had experience or not—hence the unfortunate results.

I should much like to see a poultry farm started in connection with the Department, where those wishing to embark in the business could go and get a six or twelve months' course of training, and so qualify themselves for the work.

During the year the Agricultural Department has been the means of distributing a large amount of useful information by means of the monthly Journal, by bulletins, by letter, and by advice given by visiting officers of the Department, and also in the distribution of parasites of insect pests. The Department, as a Bureau of information, is each year being more recognised and appreciated by settlers all through the State, and the correspondence has now reached very large proportions; in fact, inquiries are not confined to our own State, but they come from the Eastern States and South Africa.

Recognising the advantage of having a certain amount of agricultural knowledge within reach of the people in Perth, many of whom intend going on the land when opportunity occurs, I arranged a series of agricultural lectures during the winter months, given by the various officers of the Department. The subjects were: Fruit and fruit trees; growth of cereals; manures and their uses; horses, cattle, pigs, sheep, goats, bees, and poultry (their breeds and their management); insect pests and how to fight them; diseases of stock. The success was so great that I hope to have this area extended to the various agricultural centres this coming winter.



Paspalum dilatatum grass at Mr. A, W. Edgar's, Gingin.

The lectures were well attended, and many persons came down from the country especially to attend certain lectures. In most cases the subjects were illustrated by limelight views.

To obtain the best results in improving the condition of agriculture in this State, it is evident that the information must be carried to the people, so that they can obtain it with the minimum of inconvenience to themselves; and it will pay the State to do so.

Each farmer that is persuaded to go in for the use of artificial manures will have probably an increase of at least four bushels of grain per acre, and in many cases much more; so that not only does the farmer gain, but the State as a whole.

The administration of the Insect Pests Act has been fairly successful during the past year, and I am pleased to say the fruit-growers are beginning to look upon the inspectors as friends and helpers, instead of, as has often been the case, interlopers who came to annoy and cause trouble. The State has been divided into districts, and as nearly as possible every orchard in the State is visited at least once a year, and, in cases where pests are found, much more frequently. The troubles of the orchardist are being gradually lightened by the introduction of the various parasites that prey on the different scales. In places where the various parasites and enemies of the black scale have been liberated, the scale has almost entirely disappeared; and the same applies to the soft brown scale.

Mr. Compère was also successful in obtaining a parasite for the Cabbage Moth, which for years past has been so destructive in some districts, notably at Wanneroo and South Perth, that it was impossible to grow a cabbage fit for market. Since the introduction of the parasite the fly has been so entirely kept under that, when wanted for entomological purposes, it is difficult to obtain specimens. Cabbages are now successfully grown in all the previously infected areas.

As the result of Mr. Compère's visit to Brazil, a parasite of the fruit fly has been obtained. A number have already been liberated, and others are being kept until later on in the season, when fruit will be more plentiful. As the number of these parasites was not large, it will take some little time to see any appreciable results. A number of predaceous beetles that prey on the larvæ of the fruit fly were also introduced, and these have been liberated to increase and multiply.

Outbreaks of the Codlin Moth have occurred again during the past year at Perth and Albany, and stringent methods are being taken to eradicate it. Should we not be successful in doing so by the means that are now being employed, we may hope to do so by the aid of a parasite that Mr. Compère discovered on one of his trips. So far as can be ascertained, the pest has not spread during the past year.

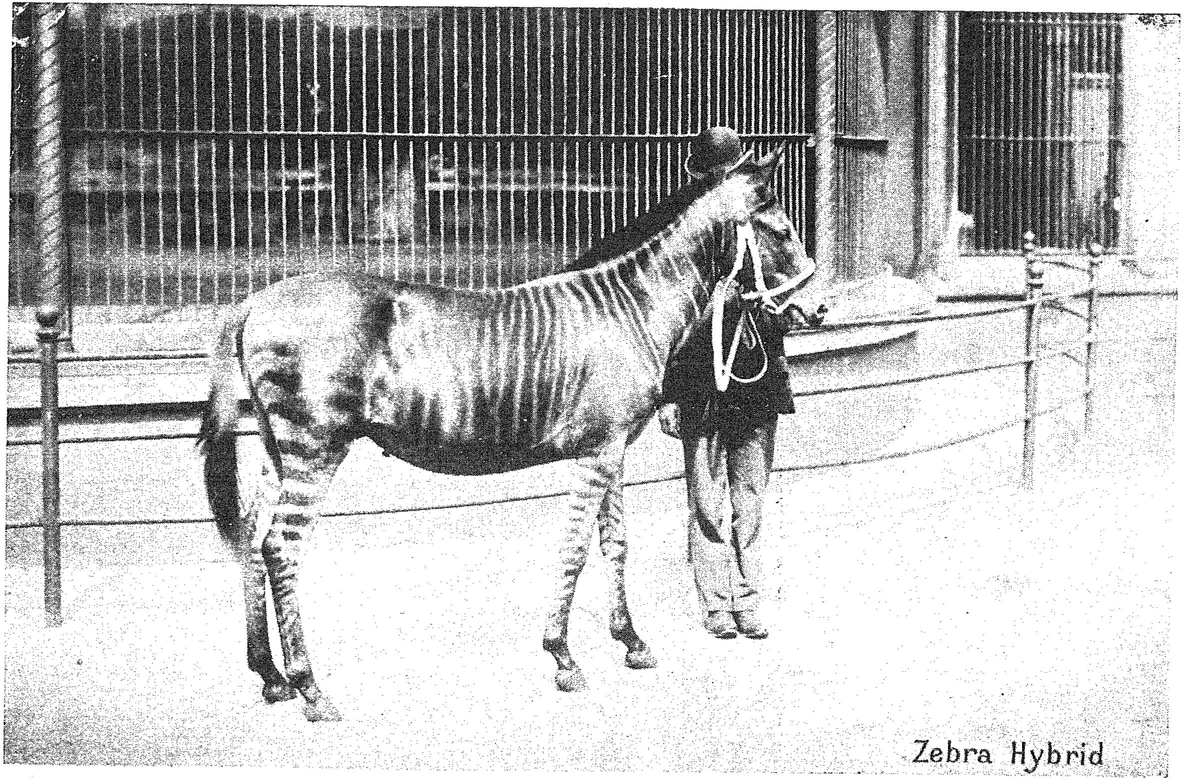
Fruit-growing and planting are steadily progressing, and during the past year a large area of citrus fruits has been planted. Apples are also receiving a large share of attention, especially those sorts that are suitable for export. The retail prices of locally-grown fruit have been very reasonable this past season, and were fully 50 per cent. under those of the previous year, and from this out we may look for still further reductions as the large areas now under fruit come into full bearing. The wine industry still remains in a rather unsatisfactory condition, as there is no uniformity in its manufacture; with the result that we have as many qualities of wine as we have makers of it. The only way to get over the difficulty seems to be to encourage the establishment of wineries amongst the vine-growers, or for the Government to establish them in some of the principal centres. At present it does not affect us so much as it will in the future, when we have a surplus and want to export, as then it would be necessary to have regular and uniform qualities.

An amendment of the Insect Pests Act is badly needed, so as to enable the Department to prevent the landing of either insects or animals of any kind that might be dangerous to the State. During the past year a consignment of oil-cake arrived badly infected with a weevil that was unknown to our Entomologist, and we had not the power to stop its introduction. The owners, however, had the oil-cake all gone over, and the infected parts thrown into the sea; but there should be the power to prevent such pests being landed or, if landed, destroyed. In fact, no animals, whether beasts or birds, should be allowed to enter the State without the permission of the Department.

Bee-keeping is making steady progress, but the season we have just gone through has been rather a disastrous one for bee-keepers, owing to the lack of honey, and many apiaries have been decimated. An expert is employed for about half the year giving instructions and helping those who are starting in the industry. There is no great advantage in trying to push this industry ahead too quickly, as the supply of honey is not very far short of the demand, and if we have a surplus there is no way of getting rid of it at a profit, as no export trade can be done with Australian honey, even the very best not finding favour in the European markets.

The monthly Journal of the Department is steadily increasing in circulation, and is evidently appreciated not only by our own people but by others, judging from the numerous extracts from it that appear in other papers. During the year a very considerable saving in the cost of publication has been effected through having it registered as a newspaper. I think the time has now come when this paper might be sent free to all *bonâ fide* farmers who may apply for it, as the benefit that would accrue to the people would more than compensate for the small extra cost.

We are frequently asked by farmers in the country to lend books from the library, but have to refuse, as the books are required



Zebra Hybrid

constantly by the officers of the Department for reference; and the question arises if it would not be advisable to establish a lending library for the use of farmers. If Standard agricultural books only were obtained, the cost would not be great. There is another way in which the same end might be even better attained, and that is that when a grant of money is given by the Government to either an Agricultural Hall or Mechanics' Institute, it should be made a condition that certain works on Agriculture would be purchased for the library. A list of the most suitable works could be drawn out and sent to each committee. Another condition should also be imposed—that if the halls were required for use by the Government Departments for educational purposes there should be no charge made.

The Government Botanist has had a large number of plants sent in for identification, and also a large number for report as to whether they were poisonous or not. For the better information of settlers it is proposed to have coloured plates made of all the principal poison plants, so that settlers can easily identify the poisonous plants for themselves. At present a collection of indigenous grasses is being made, and also of fodder plants. There are a considerable number of plants that are eaten by stock in this State that are considered poisonous by some people and not by others, and are therefore still doubtful. To establish the fact of their being poisonous or otherwise it would be advisable to have a series of experiments carried out by feeding them to various kinds of live-stock. Each year there is a considerable mortality in stock, the cause of which is often attributed to such plants, but is in many cases doubtful.

There are three experimental farms, viz., Hamel, Chapman, and Narrogin. Hamel is only a small place, where experiments are carried out on a small scale. New varieties of cereals, roots, etc., are first tested here and reported on, and those that are thought suitable are sent to the other farms to be dealt with on a large and practicable scale, and if they are found to be worth growing, or an improvement on other kinds, they are sold or distributed.

At Hamel the hybridising and breeding of new varieties of grain is carried out. This is a very difficult and important work, requiring great skill and knowledge. As the result we have a new wheat at present on the market that was bred there which is particularly adapted for our drier climates, being very early and almost free from the faults of early wheats—shedding. It has been named Alpha, and at the two other Experimental Farms there has been a considerable area sown this year. Experiments are also being made now with various varieties of oats, to try and obtain one specially suited for our climatic conditions.

Here new varieties of fodder plants and grasses are tried, and we are finding that some of our own indigenous plants (grasses) are likely to prove very valuable, and more suitable for cultivation than many of the better known imported varieties.

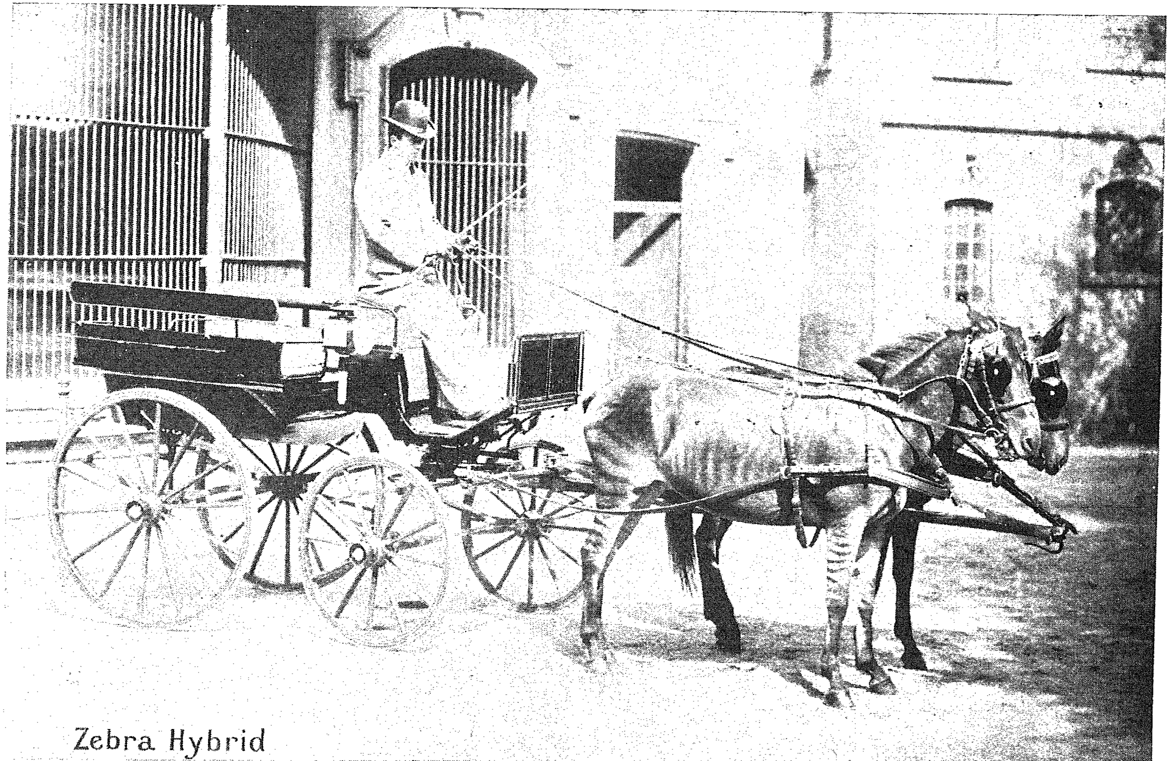
Experiments have been made for some years past, on a very small scale, in cotton-growing, and some exceedingly fine samples of good length of staple and quality have been grown. In order to test its commercial value, arrangements have been made this coming season to have half-an-acre of it planted and the crop marketed. The cotton industry is one that I think might well receive some attention, and experiments be made in the growing it in the Kimberley district, as from all accounts both the soil and climate of many parts there are admirably adapted for the growth of it. To make the experiment of any value, sufficient area should be planted to make a fair commercial test, and the cost accurately kept so that a proper profit and loss account might be made up. I am inclined to think that cotton-growing might become a great industry in the North; the only thing that might tell against it would be the difficulty of getting and the cost of labour, and this can only be found out by actual experiment.

The Chapman Experimental Farm was started in a district that was supposed to be totally unsuited for agriculture, and only fit for running sheep on. The results have been most satisfactory; wheat, oats, rye, barley, peas, rape, turnips, potatoes, and numerous other crops have been found to do well. Experiments made on the second and even third-class lands have proved that, by the addition of some phosphatic manures, they can be made to return good paying crops. The stock consists of a well-bred herd of Dexter Kerry cattle, stud Shropshire sheep, a stud of Suffolk horses, Angora goats, pigs, turkeys, and poultry. The farm has been most useful in proving what can be done in this class of country, and it means that a very large area of country is now proved suitable for cultivation that was once considered as almost valueless.

At Narrogin there is another experimental farm, consisting principally of second and third-class country, and also poison land; and experiments are being made here as to the best uses this class of country can be put to. Ten acres of it are being laid out as an experimental orchard, and various kinds of fruit trees will be tried to see which suit that particular district best. Poultry are kept on a considerable scale here, as well as other kinds of live stock.

At both farms students are received, and get a thorough practical knowledge of agriculture. Experiments are also being conducted with the various kinds of artificial fertilisers, and accurate returns are being kept that will prove very valuable in time.

One of the urgent needs of this Department is the want of an agricultural chemist attached to it. But little has been done in the way of soil analysis in this State, and there is perhaps no State in Australia where such returns are more needed, owing to the varieties of soil and their erratic distribution. There is also a grand field of work for the chemist in the way of experimenting with test plots and the uses of artificial manures, besides the analysis of the same, to say nothing of food and feeding stuffs. In



Zebra Hybrid

the Eastern States much attention is now being given to the work of the agricultural chemist, and where he combines field work with his analytical most valuable information has been the result. The farmers in this State have no reason to grumble at the returns they have been having for many years past, but the land is capable of much better things, and it is no exaggeration to say that often the harvest returns might be double what they are at present; but to do so it will be necessary that the chemist and the agriculturist work hand in hand together. The increasing of the returns per acre will mean the cheapening of the cost of production, and the doing of this will help in a great measure to prevent the coming of bad times both to the producer and the consumer.

The business of the Government Refrigerating Works for the past year was very satisfactory, and the results showed an increase of revenue of £1,134 13s. The ice storage accommodation has been greatly increased, and the works are now in a position to deal with this part of the business on a proper basis.

During the year there was a considerable increase in the quantity of frozen meat stored, and it is satisfactory to report that no mishap of any kind occurred. In connection with these works I would like to say that the work is hard and the hours are long, and that I do not think the men are sufficiently paid for the work they perform. When the responsibility that rests upon the officers there is taken into consideration, and the fact that during the whole time that the works have been running (over seven years), and that no accident has occurred, and no shortage ever occurred during all that time, it shows that the men have been careful, competent, and honest, and such men are worthy of more liberal treatment than they now receive.

The Perth markets are still in the hands of the lessee, and an action at law is in progress to obtain possession.

During the past year Mr. Weir, M.R.C.V.S., was appointed Chief Inspector of Stock. In this branch there is urgent need for the appointment of another veterinary surgeon, as the time of Mr. Burns is wholly taken up in attending to his duties of inspecting at Fremantle. There are a number of diseases in horses, cattle, and poultry that seem to be peculiar to this State, and need investigating, and such work can only be properly carried out by a qualified man. In the Victoria district the settlers lose heavily every year through the abortion of mares; hundreds of foals, and sometimes the mares, are lost annually from this trouble. What the cause of it is has yet to be determined, and meantime the State suffers. In the South-West there is a fatal disease that attacks calves—a bleeding of the nose. The mortality some seasons is very great, but so far the cause is undetermined, and it needs examination. In poultry and ducks we have a number of diseases that seem indigenous to the place, and that kill thousands every year. This also wants looking into, and there are also others; but there are some that should receive immediate attention.

During the year we were unfortunate in having swine fever introduced, and a large number of pigs died through it. As soon as it was known that the disease was here, stringent steps were taken, and the whole State quarantined, and all movements of pigs stopped. By this means the disease was stopped from spreading, and further outbreaks in fresh districts prevented. It is anticipated that there will not be any further trouble with it, and that it has been practically eradicated.

Pleuro has also, on several occasions, made its appearance, but has not been allowed to spread, having been dealt with stringently at once.

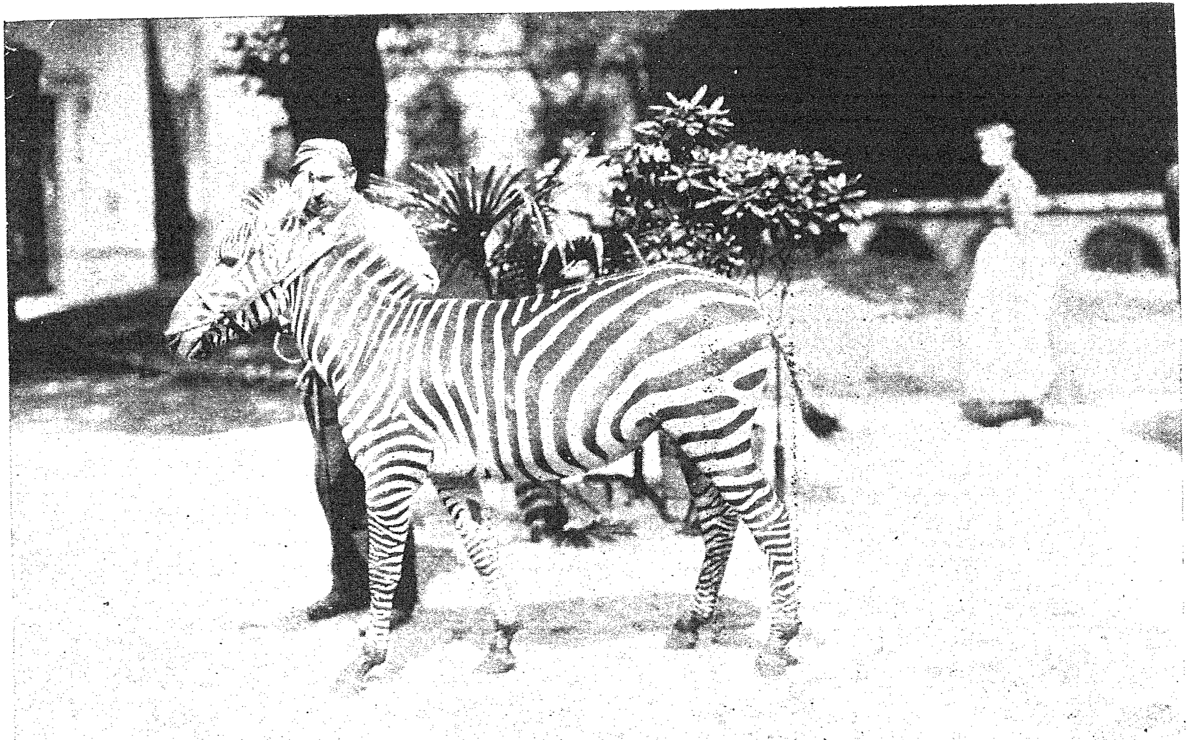
The poultry tick still flourishes, notwithstanding that strict measures have been adopted for its destruction, and if it is intended to deal effectually with it more assistance will be required.

The Eastern rabbit-proof fence has been completed for a distance of 465 miles North from the coast, and is being extended North as rapidly as possible. The inner fence is also in course of construction, but as it is well ahead of all signs or traces of rabbits, its construction is not so pressing as the Eastern fence. Many random statements have been made and appear from time to time in the Press that the fence is not likely to be effectual, but from the experience of many practical men, and what I have seen myself in the Eastern States, I am certain that, given the fence properly constructed and kept in an efficient state of repair, it will be an effectual safeguard, and that, unless rabbits are deliberately introduced, they cannot get past the fence except through gateways, and at these special precautions will be taken to see that they are kept closed. There is no doubt that at a number of places along the fence rabbits got to the Westward before the fence was constructed, but the numbers were only small, and many have been trapped or poisoned, while cats, dingoes, and iguanas have accounted for still more. Active steps are being taken to eradicate all to the Westward of the fence, and I have little doubt that this is only a matter of a little time to do so.

During the past year I noticed that the zebra was being used to a considerable extent for crossing with mares, and the offspring (called zebrules) were said to be superior to mules for all purposes, especially for army work. As we have such a large extent of country that would be suitable for breeding animals of this description, I wrote to the principal breeders in England and Holland, and also to the chief veterinary inspector in India, as to their probable use there.

Mr. Carl Hagenback was good enough to send me photographs of three zebrules and a zebra, which are shown in illustration. The chief veterinary inspector in India writes that they have obtained a number of the animals and are experimenting with them, and he will let me know the results later on.

Another illustration shows how the grass *Paspalum dilatatum* grows in some parts of the State. This is an artificial grass intro-



Kilimaryaro Zebra

duced some six years ago with most successful results, and is one of the best fattening grasses, and stands dry weather well.

Illustrations are also given of the Chapman and Narrogin experimental farms, and also of the method used at the latter for clearing the heavy timber. Illustrations of the farm, stock, and produce also show what can be done in these lines.

ALEX. CRAWFORD,
Acting Director of Agriculture.

ANNUAL REPORT.

Horticultural and Viticultural Expert.

THE ACTING DIRECTOR OF AGRICULTURE,—I beg to attach my report on the work of this branch for the year ending 30th June last.

HANDBOOK OF VITICULTURE AND HORTICULTURE OF WESTERN AUSTRALIA.

The revised edition of that work which I have had in hand, was completed and published towards the middle of 1903.

It is issued to the public at a small price, and a great many copies have been circulated. Nor is its distribution restricted to Western Australia alone. A great many copies have been posted to inquirers abroad, and applications still reach us from South Africa, India, and other countries.

In view of bringing out, at some future period, another edition embodying matters horticultural and viticultural brought up to date, I am collecting material from authentic and reliable sources bearing on questions of importance to vine and fruit growers.

SOUTHERN EUROPE TOUR.

Whilst applying last year for a three months' holiday, which I intended spending in Europe, I suggested that, when there, I should be allowed to spend a further three months in travelling through the vine-growing districts of Algeria, Spain, Portugal, and the South of France, for the purpose of following, after an interval of over 12 years, the manipulation of a whole European vintage.

During that interval of time many new methods have been introduced into the practice of wine-making. Notably in Algeria, whose climate is much like ours, I purposed investigating the means

now more generally used for controlling the temperature within the fermenting mass during vintage.

These methods I have on my return brought to the notice of our vine-growers, and intend to keep well before them in the proper season. For some years past we have been obtaining like results by means of other methods. Artificial refrigeration of the must during the process of fermentation, and the maintenance of the fermenting mass within well-defined degrees of temperature, is the main object to achieve.

Whether that proper refrigeration is obtained by chemical or by mechanical means is a mere matter of expediency, and one which can be best considered under the particular circumstances which surround each individual case.

Thus, sulphurous fumes, attemporators worked with cool water or ice, timely pumping, air blowers, picking when the weather is cool, is used with satisfactory results, according to local conditions.

During my travels many other points in connection with vine and fruit-growing which are of interest to us were noted, and I came back very strongly impressed with the necessity of reducing our cost of production if we aim at taking a share of the trade of the great export markets.

This can be realised not by revolutionising our present methods according to any one particular standard of cultivation or manufacture, but by constantly and systematically improving these methods, and paying particular attention to a more careful selecting of kinds; to the more thorough preparation and cultivation of the ground, and a less empirical and more liberal mode of fertilising; to also both timely and thorough treatment of pests; to more careful methods of marketing the produce of our orchards and vineyards, and to a less wasteful utilisation of the bye-products of the main crops.

A visit to any of the most successfully-conducted vineyards, orchards, or farms in the old world leaves on one the impression that there is no detail apparently trifling which is knowingly overlooked if it forms a link ever so small in the chain which leads to the success of the enterprise. I have already commenced the publication in special chapters of observations and notes collected on various agricultural industries during my travels, but the continuation of that work will be deprived of continuity on account of other calls on my time, either at headquarters or amongst the growers in the country.

If my trips to some of the most famous vinegrowing countries of the world have been instructive in demonstrating the progress made of late years, and in more forcibly pointing out our own shortcomings, it is with a sense of satisfaction, on the other hand, that many of our own natural advantages or our better equipment as regards farm machinery have appeared to me more strikingly evident.

The differing seasons, which are as opposite as the poles, their more reliable and less severe features, the cheaper land and the advantage of profiting by the experience of others, all insure in favour of our fresh fruit crops an enormous market, which so far has remained unexploited; a greater certainty of gathering from year to year a fair average crop must prove also a material advantage for settlers and those lacking the knowledge which is the heritage of others who from far in the past have been associated with vine and fruit growing.

IMPORTATION OF NEW GRAPES.

We already possess in Western Australia as fine a variety of grape vines as can be found in Australia. Many more varieties, however, are cultivated, possessing characteristics which would make them valuable additions to our collections.

As a result of visits made to some of the best known collections in Europe, both early and late, during the ripening season, I was able to select, after inspection of the bearing vines, a dozen varieties of choice table grapes, mostly early or late, the introduction of which will both lengthen our grape season and add some choice varieties to those we already possess.

A few cuttings of each of these sorts were introduced, and they were struck in quarantine ground, whence those that have survived the long voyage and the severe process of disinfection will be transferred in the spring to better land.

INTRODUCTION OF ECONOMIC PLANTS.

Beside grape vines, I paid a good deal of attention during my travels to other fruit trees and plants of economic value, growing under circumstances somewhat similar to those that obtain here and which, if introduced and distributed, might prove profitable.

Foremost amongst these are the Algerian *Date Palms*, which bid fair to become largely cultivated in the North-West districts of this State, as well as around the soaks on the Eastern Goldfields, where conditions as favourable as around the oases of the Algerian Sahara are met with.

The date constitutes a staple article of food amongst the nomadic tribes of Northern Africa, and some particularly choice varieties are extensively cultivated for local consumption, as well as for export to France and other countries.

The Hon. the Minister for Lands has authorised a small expenditure in connection with the importation direct from the oases in the region of Biskra, in Algeria, of a consignment of suckers of some of the best varieties grown, and it is hoped these will reach us in good order towards the end of the year.

Other trees, the introduction of which would constitute a decided gain to this country, are:

The *Spanish Carob Beans*, which bear, under favourable conditions, pods measuring 8 to 10 inches, and containing about 40 per cent. of sugar.

These beans, when crushed, are extensively used as stock food, and some trees, especially when grown on limestone formation, bear enormous crops. A great many of the wild seedlings in Algeria and in Spain are systematically grafted or budded with these improved varieties.

The *Sweet Acorn Oak*, or evergreen Oak (*Quercus ballota*), which is one of the hardiest trees I have come across, is grown on the slopes of granite mountains in the more arid regions of Algeria and of Spain. There it is carefully preserved from the axe of the charcoal burners, as it yields in the autumn heavy crops of nutritious acorns, on which large herds of swine are fattened and topped for market.

In introducing these acorns, care will have to be exercised not to liberate a destructive grub, which eats its way out of the empty shell when it is full fed.

The *Cork Oak* (*Quercus suber*) is also worth planting on account of the cork it yields. In Southern Europe, as well as in Algeria and Morocco, that industry is so regulated that a tree is made to yield a succession of crops of cork slabs, instead of being killed outright for the sake of all the marketable cork it is susceptible of yielding. These oak trees should do well on our ironstone gravel ranges after the jarrah crops have been cut off.

Experimental Orchard.

The need of such an orchard has long since been recognised in Victoria, in New South Wales, and lately in South Australia, where at Burnley, at Wagga Wagga, and at Milor, collections of trees true to name are cultivated, and where instruction on a systematic plan is given to students.

In Western Australia, where fruit growing is likely to occupy a prominent place amongst the thriving industries of the country, no attempt has as yet been made in that direction, and although the matter has several times been brought forward, it has not so far been thought expedient to establish an experimental orchard.

Such an orchard should be fairly centrally situated so as to be of easy access by the majority of settlers in search of information, and it should be located in a climate and on soil well adapted for fruit growing. A start could be made with a few acres to begin with, and a fairly representative collection of a few trees of each of the varieties worth cultivating should be planted. The educational value of such a collection would be important and would, besides settling the question of adaptability, afford typical specimens for demonstrating methods of training and of pruning, and for making growers acquainted with a large variety of fruit. At such an

orchard other promising plants could also be tested and the way paved for the introduction of new and profitable industries.

Amongst the first which deserve attention is the planting of a fairly important block of the best Smyrna figs and of the wild Capri figs, after which the department could undertake the introduction of the Blastophaga wasp, either from California, where it is now well established, or from the Mediterranean, which is its birthplace.

The immense stretches of sandy soil which fringe our coast line could not be turned to better account than by devoting it to the cultivation of the fig, both for human and stock food, and the expenditure of a few hundred pounds in the direction indicated should prove of great practical value.

Another important industry which has not hitherto received attention, and which promises to yield handsome profits is that of hop growing. Portions of the cool and humid South-West District, when compared with parts of Gippsland and of Tasmania, where hops are cultivated with success, hold promises which should be put to the test. Of hops and malt £46,000 worth were imported into Western Australia in 1901, of which amount one-third was spent on hops alone.

FIELD WORK.

The demand from country Agricultural Societies for lectures and public demonstrations on fruit culture has been well sustained, and addresses, illustrated by means of specially prepared lantern slides, have been delivered at centres along the Great Southern as well as along the South-West Railway lines, and also in and around Perth.

These demonstrations and lectures have been well attended, and afford a ready means of instructing settlers and owners of fruit gardens in methods of planting, pruning, grafting, and budding trees, as well as marketing fruit.

Marked improvements are noticeable in these methods. In every district one may find successful orchards and vineyards which may be held up as models for others, who, with the exercise of greater care and attention to details, could likewise earn for their produce better returns still.

THE WINE INDUSTRY.

Wine making, for some time past, has received from vine-growers an amount of attention which enables them to meet in open competition the produce of the older established vineyards of the Eastern Australian States with less disastrous results.

We still labour under the disabilities of higher cost of production, caused mostly by the higher wages ruling, the more limited output of our vineyards, and the somewhat primitive equipment of wine cellars.

As competition becomes keener, and in a spirit of self-defence, a better organisation will, I have no doubt, tend to place the wine industry on a more solid basis.

Many look to co-operation for bringing relief to a promising industry, and giving it a fresh impulse.

For the benefit of vinegrowers, I have for some time past collected information on that subject, and I am still in communication with co-operative wineries now at work in Europe.

In a new country where wine-making is an industry of recent date, and one which requires an amount of knowledge on the part of the grower which many have not had the time, the leisure, or the means of acquiring yet, it is better that production, manufacture, and distribution should all run in different channels, so that each may receive the amount of attention which is essential to success.

UNFERMENTED GRAPE JUICE.

Hitherto good prices have been obtained by vine-growers for their grapes, sold either for eating fresh or converted into wine.

With larger plantings, and with our market opened to the produce of the Eastern States vineyards, competition will gradually become keener and profits smaller. Yet with some little industry, and at no great cost, we could almost double the consumption of our grape production. Raisin drying has not yet been attempted on a business scale, so remunerative have been the prices obtained for the fresh fruit.

"Unfermented wine" is another means at our command for increasing largely, almost duplicating, the demand for grape juice. A great many have scruples which do not allow the use of alcoholic drinks and fermented liquors, who, on the other hand, would readily make use of pure grape juice, provided it was kept fresh without the use of preservatives which all, more or less, are unwholesome and deleterious. Pasteurising or sterilising that juice and bottling it would enable us to keep sound, long after the vintage, pure grape juice, for which a ready sale would be found amongst total abstainers, as well as amongst others who use wine and spirits. It would also lengthen the grape season and enable all those who would eat ripe grapes to continue its use when fresh fruit is not available.

AREAS UNDER VINES AND FRUIT TREES.

The following table, prepared in the office of the Government Statistician, supplies at a glance information regarding the area under vines and fruit trees in each of the magisterial districts of the State. It indicates the relative distribution of the varieties of fruit trees in localities situated under a range of climates extending from the tropical North and North-West to the cool and temperate South-West.

Areas under Vines and Fruit Trees, Western Australia, Season 1903-4.

Magisterial District.	Vines.				Fruit Trees and Small Fruits.											
	Productive.		Young Vines not bearing.	Total Vines.	Oranges.	Lemons.	Apples.	Pears.	Apricots.	Peaches.	Plums.	Figs.	Bananas and Plantains.	Other Fruit Trees.	Small Fruit.	Total Fruit Trees.
	For Wine-making.	For Table Use.														
	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.
Northampton	...	7¼	2	9¼	27½	1¼	10¾	2¾	1¼	6¾	¾	5	¾	7¼	...	64
Victoria	2¾	30	18¾	51½	9½	2½	12¾	2	2½	8½	1	17	2	6	2	65¾
Swan	665	415¾	219¼	1,300	194	38¼	452¼	108¼	44	112	52¾	74	6	90½	52½	1,224½
Northam	368¾	174	48	590¾	52¾	28	121¼	23¾	27½	51¾	23	34¼	...	32¾	...	395
York	11¾	60¾	12½	85	27¼	5½	118½	20	21¼	46¼	28¾	29	...	40½	3½	340½
Perth	134	95¼	49½	278¾	173¾	45¼	222½	61½	34¼	53¼	27	39¼	84	60½	15	816¼
Fremantle	5	68¾	18½	92¼	13½	4	46¼	5¾	9½	16¼	3¾	21¼	½	26	21	167¾
Murray	59¾	44¼	54¼	158¼	127¾	43¾	324¼	33½	28¼	54¼	21½	45¾	1¼	40¼	7¾	728¼
Wellington	149¼	131¾	99¾	380¾	206½	26¾	531	64¼	47½	112¼	52	46¼	1½	64¼	16	1,168¼
Collie	...	2	3½	5½	2	½	8	4	1¼	3½	2	½	...	4	1	26¾
Williams	6½	10	7	23½	2½	1¾	50¾	9¼	7½	15	15¼	9½	...	19¾	1	132¼
Katanning	64	88¼	37¾	190	11¾	3½	380¼	55¾	34¾	57	46½	25¼	...	72½	...	687¼
Blackwood	22¾	21¾	23½	68	11¾	4¼	719¼	96¼	10¾	105½	38½	9¼	...	40	4½	1,040
Sussex	33	10¼	10½	53¾	6¼	2½	90¼	14¼	7	22½	8	14¼	...	14	5¼	184¼
Plantagenet	7¼	10	4¾	22	4	4	577	70¼	25¾	60¾	52¾	6½	...	35½	2½	839
East Kimberley	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kimberley Goldfields	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	2
West Kimberley	...	...	...	...	...	...	...	...	...	...	...	...	¼	..	...	¼
Broome	...	...	...	...	...	...	...	..	...	...	...	...	¾	14½	...	15¼
Pilbara	...	...	...	...	...	...	...	...	...	..	...	¼	...	...	...	¼

Areas under Vines and Fruit Trees, Western Australia, Season 1903-4—continued.

Magisterial District.	Vines.				Fruit Trees and Small Fruits.											
	Productive.															
	For Wine-making.	For Table Use.	Young Vines not bearing.	Total Vines.	Oranges.	Lemons.	Apples.	Pears.	Apricots.	Peaches.	Plums.	Figs.	Bananas and Plantains.	Other Fruit Trees.	Small Fruit.	Total Fruit Trees.
	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.	acres.
Roebourne	...	...	...	...	¼	...	...	...	...	...	...	¼	¼	¼	...	1
Peak Hill	...	...	¾	¾	1	¼	¾	...	...	¼	...	¼	...	...	...	2½
Ashburton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gascoyne	...	1	½	1½	½	...	½	¼	...	¼	...	1½	4¾	...	...	7¾
Murchison	¼	¾	...	1	¾	¼	...	...	¼	½	...	½	...	...	...	2¼
East Murchison	...	¼	...	¼	...	...	¼	¼	¼	¼	...	...	...	...	...	1
Yalgoo	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mt. Margaret	...	1¼	¾	2	½	¼	¼	¼	¼	½	¼	2	...	1¼	...	5½
North Coolgardie	...	¼	¼	½	...	...	...	...	...	...	...	...	...	...	...	...
North-East Coolgardie ...	...	. .	...	...	¼	...	¾	...	¼	½	...	...	...	...	...	1¾
Broad Arrow	...	¼	1	1¼	...	...	...	...	...	..	...	½	...	½	...	1
East Coolgardie	...	...	1¼	1¼	¼	...	¼	...	...	...	...	...	...	¼	...	¾
Coolgardie	...	½	½	1	...	...	¼	...	¼	¼	...	...	...	¼	...	1
Yilgarn	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dundas	...	¼		½	...	...	¼	...	¼	¼	...	¼	...	¾	...	1¾
Esperance	...	2½	1	4	¾	½	1½	½	1¼	1½	1	2½	...	3¼	...	12¾
Phillips River	..	...	¾	¾	...	...	¼	¼	¼	¼	¼	...	...	¼	...	1½
Grand Total	1,530	1,177	617	3,324	875	213	3,670	573	306	730	375	385	104	575	132	7,938

RETURN OF FRUIT TREES AND ORNAMENTAL PLANTS IMPORTED INTO WESTERN AUSTRALIA FOR 1903-4.

In a tabulated form is shown the number of each of the varieties of fruit trees more commonly cultivated and imported during the season 1903-4.

When it is borne in mind that half-a-dozen nurseries do a very extensive business in fruit trees raised locally, the figures shown in the return give an idea of the development fruitgrowing is undergoing in Western Australia. That development has now been gradually sustained for the last ten years, and shows no sign of abating.

Some idea may be gained of the extent of that development when it is said that on an average 100 fruit trees are planted on every acre of land devoted to fruit culture.

Return of Fruit Trees and Ornamental Plants Imported into Western Australia, 1903-4.

	Apple.	Almond.	Apricot.	Cherry.	Fig.	Lemon.	Loquat.	Mulberry.	Nectarine.	Orange.	Peach.	Pear.	Persimmon.	Plum.	Quince.	Small Fruits.	Ornamental.	All others.
Albany	9,613	21	329	128	34	6	...	28	...	32	647	1,218	...	1,194	...	1,684	62	285
Esperance	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	100 rooted vines
Geraldton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	100	...	...
Fremantle	39,496	759	6,005	655	1,300	2,153	928	2,168	1,996	39,417	15,703	8,183	201	9,429	103	16,567	37,738	4,635
Totals, 1903-4 (30th June, 1903, to 1st July, 1904)	49,109	780	6,334	783	1,334	2,159	928	2,196	1,996	39,449	16,350	9,401	201	10,623	103	18,351	37,800	4,945
Totals, 1902-3 (previous 12 months)	41,828	722	3,673	1,443	360	1,008	...	988	...	15,275	14,380	7,053	...	7,154	...	10,873	35,761	1,874
Increase	7,281	58	2,661	...	974	1,151	928	1,208	1,996	14,274	1,970	2,348	...	3,469	103	7,478	2,039	3,071
Decrease	...	...	...	560	...	...	...	...	...	...	...	...	...	...	...	...	...	...

RETURN OF FRUIT IMPORTED INTO WESTERN AUSTRALIA, 1903-4.

The number of cases of fruit imported shows that, notwithstanding the rapid increase in the area under fruit trees, the importations of fruit has been more than maintained, when compared with the previous year.

Several factors explain that increase. In the first place the population has increased by over 15,000 people. Besides, young orchards are several years before coming into bearing; also the reduction in price of fruit has considerably increased the demand and increased its consumption.

Return of Fruit Imported into Western Australia, 1903-4.

	Apple.	Apricot.	Bananas.	Cherry.	Loquat.	Lemon.	Gooseberry.	Pear.	Peach.	Pineapple.	Plum.	Passion Fruit.	Pomelo.	Orange.	Quince.	All other.	Grand Total.
Albany	1,136¾	312	360	515	...	340	180	76	49	13	1,035	7	...	1,156¾	48	135	5,363½
Esperance	170	5	15	3	3	32	9	22	...	...	28	10	...	106	...	20	423
Fremantle	37,793½	688½	17,706	6,670	8	10,413	1,844	2,494½	619	237	15,783½	1,328¾	16	21,961	...	234	117,796¾
Geraldton	67	...	23	...	...	...	...	...	...	...	...	6	6	...	...	...	102
Totals for 1903-4	39,167¼	1,005½	18,104	7,188	11	10,785	2,033	2,592½	668	250	16,846½	1,351¾	22	23,223¾	48	389	123,685½
Totals for 1902-3	34,788	707	15,467	4,423	63	9,283	1,267	4,973½	...	223	8,612	555½	305	12,921	103½	615	94,306½
Increase ...	4,379¼	298½	2,637	2,765	...	1,502	766	..	...	27	8,834½	796¼	...	10,302¾	...	...	29,378¾
Decrease ...	...	...	...	...	52	...	...	2,381	...	...	...	...	283	...	55½	226	...

TROPICAL AGRICULTURE.

Irrespective of large sums of money sent out for canned tropical fruit, over £20,000 is spent annually on bananas and pineapples alone.

These fruits are now procured from Queensland and the Fiji Islands. As our requirements are not heavy enough to justify direct shipments, the cargoes are unloaded at Melbourne or Sydney, and there resorted and repacked, and forwarded on to us. In order to stand a lengthy voyage and the injury attending double handling, the fruit is not allowed to remain on the plant until it reaches that state of perfection which others nearer the source of production enjoy.

The bananas, for instance, are cut long before they are ripe being what is called "three-quarter fit." The pineapples, likewise, are cut long before they are ripe.

What with double freight, double handling, waste consequent on repacking, and long voyage, the consumer in Western Australia has to pay a long price for an inferior article.

Were the production of these two fruits alone to be effected in Western Australia, the establishment of a Tropical Experimental station and the fostering of tropical agriculture in the northern provinces of this State would be justified.

Besides bananas and pineapples, however, such hardy fruits as the Avocado pear, the cocoanut, the date palm, the guava, the litchi, the mango, the papaw, amongst others, could be grown to add to our fruit requirements; whilst amongst industrial articles of economic value for which the warmer latitudes should prove suitable, aloe-hemp and rubber plants would find within the Commonwealth a profitable and a growing market.

INSECT PESTS ACT.

Towards Easter, 1904, the control of the Insect Pests Act was placed under the Horticultural Branch of the Department by the Minister for Lands and Agriculture.

From the Chief Inspector's report I glean some of the notes which follow:—

The estimated acreage under vines and fruit trees in Western Australia is about 12,000 acres, and the number of orchards over 3,500. Many of these orchards are situated long distances away. The care of inspecting these orchards rests with five field inspectors, who are located in districts allotted to each one of them.

The Chief Inspector reports that during the year 1903-4 the field inspectors' attention have, to a great extent, been directed towards checking or suppressing the San José scale, the fruit fly, and the codlin moth.

SAN JOSE SCALE.

The inspection of orchards to locate this introduced scale every now and again reveals its presence where it had on previous inspections remained unnoticed.

In 1903 the San José scale had been detected in 295 orchards. Of these orchards 67 are now declared clean, three consecutive annual inspections conducted with care having failed to show its presence.

In 1904, on the other hand, 68 fresh cases were reported; and, on the 30th June, 296 orchards were under special treatment, or under observation. The number of infested trees was 5,170, or an average of close on 17 trees per orchard.

The number of infested orchards is about 8 per cent. of the total number of orchards in the State.

As this proportion is certainly small, and the orchards themselves are slightly affected, the provisions of the Insect Pests Act are being strictly enforced, so as to free the State of that pernicious scale at the earliest possible date.

"The returns to hand for the season," says Mr. T. Hooper, the Chief Inspector, "indicate a decrease in the number of orchards infested, and a considerable decrease in the number of infested trees. Next year I hope to be able to give a still better account."

FRUIT FLY.

This pest has not been so prevalent during the past season as it has been in previous seasons.

The daily auction room inspection, and the seizing of maggoty fruit in fruiterers' shops, has done much towards compelling fruit-growers to check the breeding of the fly by frequently picking and destroying wormy fruit.

These inspections have been more systematically and more constantly carried out, with the result that 395 cases were seized and destroyed, showing an increase of 115 cases over the previous season's total. "Still," the Chief Inspector reports, "the number of orchards infested has not materially increased." Pears were the fruit chiefly affected, peaches and nectarines coming next, with quince, mandarins, oranges, apples, and persimmons following in the order named; whilst one case each of apricots, guavas, and pomeloes are reported. The fact that apricots were not more attacked is due to the fact that they mostly ripen just before the fruit flies make themselves apparent, which is generally about Christmas.

In previous years the Department has from time to time issued notes of warning against using second-hand fruit cases, which prove the most common carriers of orchard pests, and notably the "fruit fly." It is galling, to say the least, for many who taboo these second-hand cases from their orchards to see some of their careless and slovenly neighbours cart and dump them on their side of the division fence, and use them on account of their apparent cheaper cost.

CODLIN MOTH.

The outbreaks of the codlin moth reported in 1903 in a few gardens in Perth and in Albany were again reported in 1904.

The localities affected are the same as those of the previous season. In order to cope with the outbreaks the area of ground quarantined around the infected orchards have been widened.

In Perth seven gardens were found infested, and an area containing 70 premises around, with one to a score of pippin trees in each, are now under treatment.

At Albany 15 orchards were last summer and autumn found infested. "I think," says the Chief Inspector, "these orchards were probably infected last year, but the outbreak was discovered so late that most of the fruit had been picked, so we were unable to find more than four there."

All the fruit in the infested orchards was stripped and destroyed, and the contiguous orchards were sprayed.

Stringent measures have already been taken for coping with the outbreak next season, and every effort will be made to suppress it.

ENTOMOLOGICAL BRANCH.

The Entomologist's long and almost constant travellings, as well also as the importance of the control of insect life in its bearings, more particularly with fruit-growing, have caused the work done in that direction to be placed under the Horticultural Branch.

Attention has on several occasions been drawn to Mr. Compère's useful work in connection with the introduction from abroad of insect pest parasites, and I shall therefore very briefly summarise what has been done in that direction during the year.

Mr. Compère's work is almost exclusively directed towards fighting nature's pests by nature's own means. For some time past California, Hawaii, and Western Australia have been engaged in introducing from their habitat the natural enemies of their insect pests, and hitherto the results have proved very satisfactory.

Whenever parasites are not procurable, sprays and fumigation or other means of checking insects are still resorted to, but as these methods are costly and ever recurring, they are now only enforced in the case of those pests which are still in Western Australia without some known effective natural enemy to keep them in check.

Since he joined this department Mr. Compère was sent to the Eastern States, and successfully introduced from Queensland and from New South Wales—

Two internal parasites of the Black Scale.
Two internal parasites of the Soft Brown Scale.
One internal parasite of the Cabbage Moth.
One internal parasite of the Cabbage Aphis.
One Ladybird predacious on the Mealy Bug.

A second trip took him to the coast of China, the United States of America, and the Mediterranean region.

From Spain and the South of France he sent us several useful kinds of ladybirds, a parasite of the grain moth (*Gelechia cerealla*), and one of the grape-vine scale (*Lecanium cymbiform*).

A third trip took Mr. Compère to India in September last, his mission being to search for parasites of the "fruit fly" (*Ceratitis capitata*).

That particular fruit fly he did not notice there, but during his travels he was able to collect and rear over 20 species of fruit flies, "each one of which has its own species of parasites. Many of them, in the absence of their own food, may attack other species in order to perpetuate their own kind, and accomplish a great amount of good."

Several of these parasites he successfully introduced on his return, and they were liberated on trees carrying wormy fruit. The results of this introduction are not yet evident.

The practical result of that trip is that it has been proved that to India we must look for several efficient parasites, some—and the most efficacious amongst them—preying on the eggs, and others attacking the fruit-fly maggot itself.

A fourth trip was planned as the result of deductions drawn by Mr. Compère from correspondence received from Brazil. In January last he left for Brazil, *via* the United States, and whilst in California had an interview with the State Commissioner of Horticulture for that State, the outcome of which is that shortly after, Western Australia and California agreed to jointly utilise Mr. Compère's researches for useful parasites of agricultural insect pests, and bear in equal proportion the cost of the same. As many of our requirements are identical, and some can be satisfied without detriment to the wants of the other, the agreement is likely to prove mutually satisfactory.

In the course of that fourth trip the travelling entomologist visited Brazil, and while there was successful in locating in that country the home of the fruit fly (*Ceratitis capitata*, Wend.), which for some years past has been causing misgivings to our fruit-growers.

He collected and personally brought back to Western Australia two natural enemies of the fruit-fly maggot, viz., one a scavenger ground beetle which is likely to prove an active check against blow-flies as well, and another, a true parasitic fly which does good work in Brazil.

Some of these parasites were liberated on trees carrying wormy fruit soon after they arrived, whilst others are lying in a dormant stage at a low temperature at the Government Refrigerating Works. They will be brought out into a warmer temperature in the late spring, when the fly pest will come in evidence again.

Amongst the other parasites Mr. Compère has been commissioned to procure for us are those of the locust, the red scale, and other insect pests of lesser importance at present in Western Australia.

Whilst so engaged he will also collect and introduce into California those parasites of the codlin moth he has already discovered in the South of Europe.

Californian and Australian fruitgrowers alike will benefit from such an introduction to an extent which it would be hard to represent in money value, but which cannot fail to be considerable.

A. DESPEISSIS, M.R.C.C.

25th September, 1904.

Annual Report of Field Officer.

THE ACTING DIRECTOR OF AGRICULTURE,—I have the honour to hand in a Report of the work carried out by me during the past year:—

During the first half of the past year, I was actively engaged in my duties as Field Officer of the Department, and was constantly travelling in the agricultural districts, looking after the various experimental plots and farms, lecturing, and giving information on various subjects.

On February 6th I left Perth to take up my duties as resident manager of the Narrogin Experimental Farm, since which time my duties have been confined to this institution, which I have not left since that date.

During the year I made three trips to the Eastern Goldfields. In September I took an exhibit of produce from the experimental plots at Hamel, and a collection of specimens from the Department to Boulder City, and exhibited the same at an Industrial Exhibition which was held in that town; these exhibits were quite an attraction, and caused a good many inquiries to be made with regard to agricultural matters.

In October I paid a visit to Coolgardie and inspected and furnished a report on the sites selected for the establishment of an irrigation farm by the Coolgardie Water Supply Department for the purpose of showing what can be grown by the help of water in these dry districts. I duly reported on the most suitable site, at which the preliminary work of the farm has now been started. In November I paid another visit to Coolgardie and delivered a lecture on Irrigation at the Town Hall, a full report of which was published in the Coolgardie *Miner* of the following day.

Experimental Plots.—Experimental plots were carried out at each of the following places—York, Northam, Newcastle, Narrogin, and Mt. Barker; but as the results of this work were published in the *Journal* of the Department for March last, it will not be necessary to reproduce it in this report. An experimental plot for the growing of maize and other summer crops was established at

Mr. Hawter's Nursery at Mullalyup, but so far no report has yet come to hand.

Increased Yield of Crops.—As I have now left the Perth office I cannot obtain the figures to give a complete list of the increased yield of the various farm crops the same as I prepared last year; the increase, as I anticipated in my last report, has made a record during the year, a record which I anticipate will again be broken in the coming season. The figures showing the increase in the acreage under wheat and in the estimated yield are as follows:—

	1903.	1904.
Area under wheat ...	92,695 acres ...	136,665 acres
Total yield	985,559 bushels ...	1,899,550 bushels
Average	10·67 „ ...	13·90 „

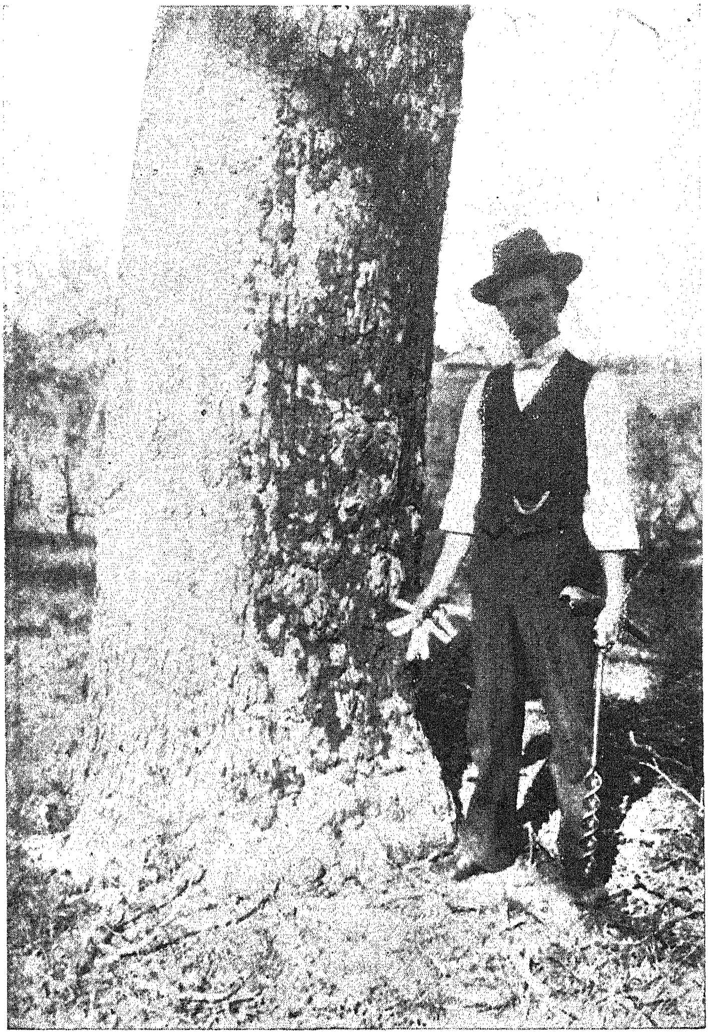
In comparing in my last report the quantity of wheat produced and the quantity of mill products imported, I pointed out that we produced 25,537 tons of wheat, but imported 28,211 tons of mill products, and therefore required to about double our production before we became self-supporting. This increase has come about in one season, and as another great increase will probably take place next season, we shall have a large surplus to dispose of. As soon as we become exporters of wheat, the price we receive will be governed by the London market, irrespective of the cost of production and local conditions, and as this means accepting a lower price it will be to the interest of growers to turn their attention to the best means of lowering the cost of production by the means of the latest improved machinery, obtaining good seed, and growing the varieties most suitable to the district.

Chapman Experimental Farm.—On Mr. A. Crawford being transferred from Geraldton to fill the position of Acting Director, I, on 16th September until 1st February, took temporary charge of this farm, pending other arrangements being made for the management, and during this period I paid seven visits to the farm, paid the accounts, and gave what instructions were necessary to keep it going until a permanent appointment was made.

NARROGIN FARM.

The work at this farm has made good progress during the year. During the first part of the year I paid monthly visits to the farm, but when the buildings were finished and we were prepared to take students it became necessary for a resident manager to be appointed, and the Hon. Minister was pleased to appoint me to the position. I took up my duties on 8th February, and am now able to devote the whole of my time to the farm, and I hope that the coming year will see many improvements.

In November an exhibit of produce and stock was made at the Narrogin show, and an invitation was issued to all settlers and visitors to pay a visit to the farm on the following day. This invitation was fully availed of, and over 70 visitors attended and partook of light luncheon at the farm and spent several hours in looking at the farm buildings, crops, and stock.



Clearing Heavy Timber, Narrogin Experimental Farm.

The main buildings at the farm were no sooner completed than it was found necessary to provide more accommodation, and accordingly eight additional rooms were erected, and we now have accommodation for 10 students.

The first students came to the farm early in February, and at the present time we have four, but hope shortly to increase the number, as we have now both work and accommodation for them. Lectures were started the first week in March, and since that date I have delivered two lectures each week, on Monday and Friday evenings, from 7·30 to 8·30.

The students have so far been engaged in feeding stock, poultry, and pigs, milking, slaughtering the necessary stock for food, chaff-cutting, grubbing, and burning off timber, threshing and winnowing wheat, and the various jobs that are always waiting to be done on a farm.

The great check to extensive operations on the farm is the heavy timber which has to be cleared before any farming can take place. During the year we have devoted as much time as possible to grubbing and burning off timber, which consists of heavy red gum, and we are unable to let the work by contract, and have to get it done by day labour.

I am glad to be able to say, however, that we have made considerable progress in this work, as is evidenced by the fact that we are sowing about 140 acres of new land this season, which is worth on an average about £5 an acre to grub and burn off. We have made considerable use of explosives for the purpose of breaking up the large logs and thereby enabling them to be burnt up quicker, and have found this means both effective and economical; it is especially advantageous when burning off large red-gum logs, which burn very slowly and cannot be hurried along. A series of views showing the trees before being blown up and afterwards was published in the *Journal* of the Department of Agriculture, for January, 1904. A full set of views was also published in this same number, giving illustrations of the buildings, etc., on the farm, plates are also reproduced in this report.

Buildings.—The only new buildings erected during the year have been the additional rooms attached to the students' quarters, a circular stone silo, half in the ground and half out, and a few pig-sties, and a small office.

The silo is 12 feet in diameter, inside measurement, 20 feet high, and will hold, when full, about 50 tons of ensilage, and we hope to be able to fill it during the spring with our surplus green fodder, and make sufficient ensilage to tide us over the following winter.

The rooms for students are built of bats and cemented on the outside and plastered inside; the rooms measure 10 feet by 6 feet, and each student will have a room to himself.

Boring for Water.—A boring plant, kindly lent to us by the Engineer-in-Charge of the Water Supply Department, has been at

work for some little time past trying to find a supply of water, as the farm is very deficient in this respect, and we are unable to carry any number of stock owing to the shortness of water. After putting down several unsuccessful bores we were at last successful in finding water in four places at a depth ranging from 50 to 100 feet; one of these bores has struck a splendid supply of water at a depth of 53 feet and the drill went down to 68 feet, and this gives us 15 feet of water in the hole; the supply is estimated at from three to four thousand gallons per day, and being on a flat piece of land and the water good, should, when a well is sunk, enable us to irrigate a small area of ground and grow some lucerne for the stock, and also to run a vegetable garden to supply the institution with vegetables. The bore is in soft ground and it will be easy sinking, but the well will require timbering. Of the three other places where water was struck, one other well will have to be sunk, and the most suitable place is in a corner from which, with a little alteration of the fences and a little piping, five paddocks can be supplied from the one well. This will mean a great saving of expense, and if these two wells can be sunk before the summer comes on, we ought to have a plentiful supply of water for all purposes, as we anticipate storing 60,000 gallons of rain water this winter.

Machinery.—We have added to our plant during the year a reaper and binder, a farm wagon, a Benicia Hancock disc plough, a set of harrows, a seed grader, a small threshing machine, and a treadgear for the purpose of supplying power for driving the various farm machinery. This latter machine, although largely used in the United States of America and Canada is a new introduction in this district, and has attracted considerable attention from all who have seen it, and is, I think, one of the cheapest forms of power it is possible to obtain. Two horses put in it are able to drive the threshing machine and winnower, while one horse is sufficient to work the chaff cutter. The horses, after their first excitement of going into the machine is over, do not mind the work, and get no more exhausted than at any other form of work. The treadmill is portable and on wheels in the form of a wagon. The horses are put into the pole, and the machine can be taken to any part required, when two of the wheels are taken off, the horses placed inside, and the machine is ready for work. The treadgear is available for any kind of machinery such as chaff-cutting, threshing, winnowing, wood-cutting, for which a light driving power is required. The cost being low, it is available to the ordinary settler who requires a cheap form of power for occasional use. Several local settlers have expressed their intention of obtaining one of these machines.

Poultry.—The stock of poultry has been added to during the year, and a large number of settings of eggs, as well as a good number of young stock, have been disposed of for breeding purposes. Further changes in this branch are contemplated in the direction of keeping fewer breeds of birds, but to import new strains of the breeds that we decide to keep, and thereby be able to supply settlers with a strain of bird unrelated to any others in the State.

Clearing Heavy Timber, Narrogin Experimental Farm. After the Explosion.
Cost of Explosive, 1/4.

Live Stock.—We have added to the live stock on the farm during the year the following animals:—

Cattle.—The Ayrshire bull "Peverill," by "Scotland" (84 A.H. B. of A.), imported from Victoria by the Department of Agriculture some two years ago. Also four milking cows and three calves, as well as a cow and a steer for fattening for beef.

Sheep.—We have purchased 105 merino lambs as well as a Shropshire ram and 11 Shropshire ewes to start a stud flock. These, together with 33 lambs from our own sheep, comprise the increase for the year, against which we have killed 76 sheep for food, and have received for the sale of meat, skins, and wool £74 1s. 1d. At the present time we have 175 ewes and 50 ewe lambs on the farm; these ewes are now lambing. Although we have plenty of poison plants in the paddocks, we have lost no sheep from this cause during the year.

Horses.—We have increased our stock by the purchase of three medium draught and two light horses, and have sold one animal that was unsuitable.

Goats.—A herd of Angora goats has been established at the farm, we having been supplied by the Department with 18 does and three bucks. These are now running in the paddock, in which there is plenty of scrub for them to eat.

Pigs.—Two large Berkshire sows and four young sows were obtained from Mr. Morrison, at Guildford, and a young boar of the San Toy breed from Mr. H. J. Saunders, of Henley Park, with which to start pig raising. We have also purchased locally 19 young pigs, which we are fattening and killing for food as required.

Farm Crops.—The crops last season comprised about 85 acres, and consisted principally of wheat and oats; the varieties and yields were as follows:—

Barootta Wonder Wheat:	average yield,	12	bushels	per acre.
Jade	,,	14	,,	,,
Crossbred 172	,,	10	,,	,,
Australian Talavera	,,	8	,,	,,
Medic	,,	12	,,	,,
Alpha	,,	12	,,	,,
White Lammas	,,	12	,,	,,

Smaller lots of Federation, Allora Spring, and Fill Bag were sown, and sufficient seed raised to sow a larger area this year.

The following varieties of wheat were cut for hay:—Marshall No. 3, Australian Crossbred 113A, Tardent's Blue, Fife Essex, Field Marshall, Australian King, and Steinwedel.

Oats.—Early Ripe yielded 24 bushels per acre, and Chinese Hulless 5 bushels per acre. Gartons A and Gartons C oats were cut for hay.

Rye.—One acre of rye yielded at the rate of 8 bushels per acre.

The wheat was sown at the rate of ¾ bushel, and the oats 1½ bushels of seed per acre. The manure used was bonedust and nitro-superphosphate mixed together and sown at the rate of 112lbs. per acre. Owing to the excessive wet season the yields were not as high as expected, but are above the average yield of the district.

Other crops grown all more or less successfully include barley for green feed, potatoes, melons, pumpkins, cucumbers, maize, sorghum, tomatoes, buckwheat, millet, and artichokes. The maize did very well, and supplied us with a large quantity of green fodder and some cobs of a fair size. I hope to prove in the future that in a favourable season maize can be satisfactorily grown for green fodder or ensilage in this district.

I am glad to be able to report that for the present season we have been able to considerably increase the area under crop, and have sown every acre of land that we have been able to get cleared, and at the present time have sown 200 acres which consists of 104 acres of wheat for grain, 55 acres of wheat for hay, 20 acres of oats, 16 acres of barley, and five acres of rye. This represents an increase of 115 acres more than were sown the previous season.

Meteorological.—As soon as I took up my residence here I succeeded in getting the instruments supplied by the Observatory to start a meteorological station, and the weather observations are now taken twice a day.

Since the observations were started the mean temperature of the months has been: March, 66·5 degrees; April, 61·7 degrees; May, 52·5 degrees; and June, 50·4 degrees.

The rainfall for the same period being: March, 156 points; April, 94 points; May, 196 points; and June, 520 points, or a total for the four months of 966 points.

In conclusion, I would like to point out that the most pressing necessity at the present time to enable us to continue operations in a proper manner is to get a further quantity of clearing done. At the present time we have every acre of cleared land under crop, and require land to fallow so as to enable us to work the farm in an economical manner, and I would ask that the sum of £250 asked for on the Estimates for this purpose be made available at once to enable us to get the clearing done before the close season starts, as if we have to wait until 1st March it is then too late to plough and prepare for next season, besides which the land is better fallowed. I would also ask for the money to enable us to sink a well to make use of the good supply of water recently found by the drill.

PERCY G. WICKEN.

7th July, 1904.

Annual Report of the Government Botanist.

THE ACTING DIRECTOR OF AGRICULTURE,—I have the honour to report that during the year, 1st July, 1903, to 30th June, 1904, many plants were received for identification, and reported on. Among these were *Sisymbrium Irio* and *Brassica Sinapistrum* (Charlock), which were sent from Northampton with the information that milk and butter had been so tainted through their consumption by cows as to be unfit for use. The poison plants received, as suspected of having caused the death of stock, included *Oxylobium tricuspidatum* from Mindarin, *Gastrolobium spathulatum* and *Oxylobium reticulatum* from Katanning, *Duboisia Hopwoodii* and *Gastrolobium bidens* from between Lake Way and Lawlers, *Chorizema Dicksonii* from Newcastle, and *Oxylobium retusum* from Australind. Many of these species have no definite facts recorded against them, although their botanical relationship alone suggests that they may have poisonous properties, and it is regrettable that the farmers and others who send them to the Department do not supply more information regarding their effects on stock. The first thing to be made sure of is, that the animals actually did devour the plant, and, if that were not observed, then its presence in the stomach of the carcase would furnish presumptive evidence. It would be a saving of loss in the long run to stable an animal and feed it on the plant suspected, so that definite information might be secured that would obviate all further loss, except what might be legitimately put down to accident.

In order that the West Australian flora might become better known abroad, I have distributed the seeds of a considerable number of native herbs, shrubs, and trees to various parts of the world, where much interest is taken in their cultivation. It is unfortunate that I am unable to utilise what is offered in return for these contributions.

At the request of Mr. R. T. Baker, Director of the Technological Museum of Sydney, the leaves of various species of Eucalyptus were collected by the Department, and forwarded to Sydney, to serve for the continuation of the important research by Messrs. Baker and Smith on the correlated chemical and botanical characteristics of these plants. Mr. Baker has kindly offered to communicate to the Department an account of the results attained, so that the publication of these in the *Journal* of the Department may be looked forward to. To the liberality of Mr. M. C. Davies, of Karridale, we were indebted for a supply of karri and other leaves for this investigation. Mr. B. T. Goadby procured a number of plants of *Cephalotus follicularis*, the West Australian pitcher-plant, for transmission abroad. A collection of cuttings of succulents was received from the Cambridge Botanic Garden, and sent on to the Government Gardens, Perth.

To the Herbarium has been added a considerable number of specimens collected at the Wongan Hills and the Upper Chapman River; twelve species of Eucalyptus were contributed by Mr. W. V. Fitzgerald, and specimens of the New South Wales *Coniferæ* from the Technological Museum, Sydney; while fresh specimens of cultivated grasses, etc., received from Mr. Berthoud, of Drakesbrook, were pressed and added to the collection.

After making an inquiry into the causes of the death of forest trees along the Great Southern Railway line, I come to the conclusion that bush fires were the source of the excessive mortality among the trees there, especially the White Gum or Wandoo (*Eucalyptus redunca*) and Raspberry Jam (*Acacia acuminata*). A report was furnished also on the possibility of abortion in mares, prevalent in the Greenough District, being caused by poison plants, but no facts having a decided bearing on the question were ascertained. The article on the Flora of the State, published in the West Australian Year Book, was re-written for the forthcoming issue of that publication.

ALEX. MORRISON,
Government Botanist.

30th June, 1904.

Annual Report of Editor of "Journal" and Librarian.

TO THE ACTING DIRECTOR OF AGRICULTURE—I have the honour to report on the *Journal* and Library as follows:—

The Journal.—It is pleasing to note from Press notices and public demand that this publication is being more widely recognised as a means of disseminating valuable knowledge to farmers and others, and that it is continuing to increase in its circulation.

Acting on the approval of the Hon. the Minister, an offer was made to supply the public with free copies of the old numbers of the *Journal* for the years 1900, 1901, and 1902. This offer has been largely availed of, so much so that during the week following the publication of the notice 14 applicants were supplied with 37 copies each, a total of 518 *Journals*. Applications are still being made for copies almost daily.

As some of the numbers are running short, while we have hundreds of copies of others, I should suggest that we reserve at least fifty copies of each number, and make parcels of the surplus for distribution at shows, etc. I do this for three reasons—(1.) They are taking up a lot of room; (2.) They are being destroyed by rats, etc.; and (3.) as they contain much useful and valuable

matter, the farmers, settlers, and others would of necessity greatly benefit by a perusal of them, they being of much more value if in circulation than lying on the shelves.

The *Journal* having been registered as a newspaper, considerable saving will be made in the postage. It would be of great benefit to a large number of settlers if you would carry out your suggestion, and allow the *Journal* to be sent to all *bonâ fide* farmers, orchardists, vignerons, and gardeners on payment of one shilling per annum. This, as you are aware, is being done in the majority of the Eastern States.

Bulletins.—Last year I commenced the publication of *Bulletins* containing the more important articles that from time to time appeared in the *Journal*, and these now number thirteen. One, viz., that on Poultry, has had to be reprinted.

Blocks for Illustrating Articles.—I am pleased to report with regard to this matter that the whole of the blocks have now been properly classified. The blocks themselves have been stored away in their respective cabinets according to their subject, while an impression of them has been registered in a book kept for that purpose. Not only will this save a very great deal of deterioration to the blocks themselves, but it will enable the officers to select such blocks as might be suitable to illustrate their articles without having fresh ones made. It also enables me to keep a check on all the blocks, and to tell at a glance whether we have any particular cut or not.

The following will give an idea of the number of blocks and their subjects:—

33 of Cattle	28 of Horses
34 of Sheep	10 of Pigs
32 of Draining, etc.	35 of Animal Diseases
14 of Plant Diseases	45 of Farm Implements
67 of Crops	28 of Clearing, etc.
18 of Miscellaneous	18 of Bees
28 of Poultry	19 of Planting
18 of Grafting	20 of Budding
87 of Pruning	54 of Fruit
32 of Picking, Packing, etc.	39 of Winemaking
56 of Pollination, Bacteria, etc.	36 of Fungus and other Diseases
128 of Insects	20 of Spraying and Fumigating
67 of Grasses and Forage Plants	26 of Noxious Weeds and Poison Plants
30 of Orchards and Vineyards	61 of General Views.

A total of 1,081 blocks. These are kept in three cabinets, having drawer space of 124 square feet, and occupying a floor space of 9 feet 6 inches by 1 foot 6 inches. I would here suggest that provision be made on the Estimates for the duplication of these cabinets, as those now in use are full.

I have also commenced a registration of all photographs taken, showing what are used for illustrations, lantern slides, etc. This will take some time yet to complete.

The Library and Museum.—I am pleased to be able to report that the public have readily availed themselves of perusing the many new text-books that have been recently added to the library. There are many more that are required, and it is to be hoped that you will approve of an early order being given for them.

I would also suggest that some of the older books be replaced with the latest published; for instance, Johnston's "Elements of Agricultural Chemistry," the one we have in the library is the twelfth edition, and was published in 1887, while the latest is the seventeenth, and is nearly twice the size. There are a number of others that could be mentioned. Subjects that were referred to in the earlier editions as being doubtful experiments are referred to in the later editions as being successful and accomplished facts.

The Museum has also attracted a fair share of attention, and with regard to this I would suggest that specimens of all poison plants, together with natural grasses and noxious weeds, should be mounted and displayed.

Considerably more table space is required for papers, journals, etc.

One matter I would like particularly to draw your attention to, is the great inconvenience caused by books and papers being removed from the Library and not always returned, thereby preventing others from using them.

I have, etc.,

G. C. BAKER,
Editor and Librarian.

28th June, 1904.

HAMEL STATE FARM.

Annual Report for Year ending 30th June, 1904.

THE ACTING DIRECTOR OF AGRICULTURE,—I have the honour to report briefly as follows, relative to the work done here during the past year ending 30th June, 1904:—

HAMEL STATE FARM,

situated on the resumed Hamel estate, adjoining Hamel siding, on the South-Western Railway, about 70 miles South from Perth.

Buildings consisting of a W.B. dwelling-house containing five rooms, one of which is furnished and reserved for the use of visitors. The out-buildings are one stable, cart and produce shed, constructed of wood with galvanised iron roof.

The homestead paddock contains $18\frac{1}{2}$ acres, mostly low land. Fourteen acres next to the railway line are laid down with permanent pasture grasses of the best varieties. The balance of the land along the edge of Samson's Brook will be devoted to the culture of maize, potatoes, and other summer crops. The experimental orchard and cereal plots will be on Blocks 7 and 8 on James Road, one mile from the railway station. Block 10, on the opposite of James Road, lately cleared and fenced by prison labour, will be ploughed and cultivated later on. A small part of the work is still carried out in the cultivation of native flowers and grasses on Location 26, adjoining the manager's private residence. It will be noted that the experimental plots are somewhat scattered, chiefly owing to the intervening blocks having been sold for close settlement. The whole area, including clearing, consists of 40 acres.

Staff.—G. F. Berthoud, manager; W. C. Crawford, ploughman; B. Fitzpatrick, general assistant.

Work.—The general objects of the work carried out here are purely experimental, that is to say, chiefly for testing new varieties of grain, grasses, fruits, and some flowers; the main object always kept in view, being the improvement of plants by selection, and also in some instances by cross-breeding. Such work requires minute care and constant attention to obtain even a moderate share of progress towards the results desired. This work, therefore, cannot be undertaken by the cultivator who grows only for quick profits. Take, for instance, a cross-bred variety of wheat; this will require six years of careful selection before it proves reliable and true to the type desired and ready for sending out for general culture. In most instances nine-tenths of cross-bred plants have to be rejected. Of the new wheats raised here only one, "Alpha," is now ready for extensive cultivation. This wheat, by its early maturing qualities and nice grain, may in the near future become a leading kind for the dry districts.

Season.—The rainfall during the late winter and spring months was considerably in excess of the usual average. The land being low and flat, was in many places covered by surface water for several days at a time; owing to this cause, the cereals and some other crops gave very poor returns. We have no rain gauge here, but I think the total rainfall was not much under 45 inches; the greater part of this rain fell between the 1st July and the middle of October. We had very little rain during the summer, which was a mild one (except a few very hot days) and favourable to the crops.

Grasses and Fodder Plants.—Sixty varieties were grown on trial plots; of these, several proved useful and suitable for general culture. In the homestead paddock, 14 acres have been sown with the best sorts, for permanent pasture; they are coming up nicely, and later on should be a useful object lesson for farmers and others interested in the matter.

Cereals.—Sixty varieties were grown on experimental plots, a total area of nine acres. The results as a whole were poor and very

disappointing, averaging a little over 10 bushels per acre. The strong flour wheat Minnesota 169 yields a fair return of grain; its beautiful clean straw being well adapted for the production of high-class hay.

Potatoes.—Small trial plots of 14 imported varieties were grown with fairly satisfactory results. A large plot of seedlings from local seed were raised; of these, 140 of the most promising plants were selected for future work.

Maize.—Fifteen varieties were grown on fairly large plots, with satisfactory results. The mild summer and the moist subsoil were very favourable for the successful growth of this crop. Maize, when grown for grain, will yield payable returns only when grown on good soil, which retains a fair moisture throughout the summer.

Cotton.—Three varieties grown on small trial plots, with fair results. This crop is, however, likely to prove an unreliable one here, owing chiefly to the autumnal rains frequently discolouring the lint. Cotton should thrive well in the Kimberley District, where it may prove to be a profitable industry.

Miscellaneous Plants.—A large number of these were grown on small plots, with fair results.

Native Flowers and Grasses.—Considerable success has been attained in the interesting work of cultivating and selecting some few of the many beautiful varieties of everlasting flowers, native of this State. A few of the indigenous grasses have also been cultivated with fair results, notably one of the strong-growing "Andropogons," from the Kimberley District. In this part of the work, one of the chief difficulties is in obtaining ripe seed. Residents in the interior, with few exceptions, take but little interest in collecting seeds at the right time, when they are fully matured. In many instances, those seeds received had been gathered too soon, and they failed to come up. I shall always be delighted to get seeds of any native plant for trial here.

Seeds and Plants.—A large number of these have been distributed to applicants in various parts of the State.

Information supplied.—Numerous queries relating to crops, seeds, mode of culture, etc., have been replied to.

Visitors.—Many local agriculturists and others have called to inspect the various plants, etc., during the past summer. Farmers especially desire information relating to the best varieties of grasses. The best time to see the plots is from October to Christmas.

Live stock is not kept here, with the exception of one draught horse, used for ploughing and general farm work.

G. F. BERTHOUD,
Manager.

Annual Report of Bee Expert.

Wingate Apiary, S.W. Railway,
9th June, 1904.

THE ACTING DIRECTOR OF AGRICULTURE,—I have the honour to report that the season just closing in this State has been one of extreme difficulty, the practical apiarist having had some trouble to keep bees in such condition that they may take advantage of any improvement in the flow of nectar, which in only a very few cases has been realised. while those with but little experience have lost very heavily in consequence of the unusual conditions which have obtained.

The previous season was, in some parts of the State, exceedingly good, while in others it was only medium, yet I feel safe in stating that my estimate of 150 tons of marketable honey was much below the true figures; while for the past season I will be very much surprised if the total output should reach to 10 tons.

The same may be said about the number of hives, which was then close on to 5,000 colonies, while this season less than half, if so many, are to be found.

From personal experience, the past season has been the most trying we have had for the last 10 years, from the standpoint of the beekeeper.

Still I have every confidence in stating that there is not any need for us to despair, as we cannot expect that every season will be any better for the beekeeper than is obtained in other callings.

That there is a great future before us, and that the industry may be expanded considerably to the interest of the State and the individual apiarist, there is not any doubt, as the natural flora, combined with our forest trees, will always give satisfactory results during ordinary seasons.

When we take into consideration that we had not any spring weather this last season, as the rain and exceedingly cold weather continued into the month of November, followed with extreme heat, which continued for several months, the rains destroying the early blossom and nectar, and Nature having no opportunity during the hot season to reproduce, it is not surprising that bee-culture was somewhat of a failure.

Up to the end of December, there was only time to reach a few of those which were most anxious to have my assistance; and in my travels I delivered 24 lectures with lantern views, all of which were well attended and much appreciated.

I am pleased to state that only very few cases of disease came under my notice, and in each case I personally dealt with them; and as I have not heard of any further trouble, in either case, I presume results are satisfactory.

Since 1st January, as I have only been able to visit a limited number of the districts—practically only those where previous engagements had been made—and in these I delivered seven lantern lectures and gave several object-lessons, each being well attended and much appreciated.

Notwithstanding the many lectures and practical object-lessons—giving, in the latter cases, the why and wherefor for making alterations, and putting in order hives and bees, to those able to handle and operate—it is still apparent that there is much to be done in educating and instructing before better results can obtain.

During the previous season I induced a good many persons—practical fruit-growers and others—to embark in the industry, who during this trying season have been most anxious for advice and instruction that could not be given, consequently they are very much discouraged, as they have in most cases lost the few bees they had got together.

During such seasons when food is short, chill brood, paralysis, and other pests or troubles come thick and fast, and unless dealt with in a proper manner will menace the rest of the bees in the district, and many do not understand their danger and do not report. Only one single instance has come under my notice of the owner calling attention to disease, while those I found were totally ignorant of its presence until it was pointed out to them.

The only district that has had a normal condition, and has got a fair return, is the Albany district, from Mount Barker to King River, and they have marketed more produce this season than in any previous year.

I must not close these notes without expressing the hope that every beekeeper be compelled to register the number of stocks he has each year, and that the amended Act of contagious disease among bees will have attention during the coming session.

I have had inquiries from persons beyond the State anxious to know what prospects there are here for apiarists; in each case the true conditions have been given, both as to the prospect, possibilities, and the markets at our doors.

JNO. SUTTON.

STOCK BRANCH.

Report by the Chief Inspector for the Year ending 30th June, 1904.

THE ACTING DIRECTOR OF AGRICULTURE, — For general information, I am forwarding herein my second Annual Report, showing the work performed by this Branch during the past twelve months.

With the exception of severe mortality amongst pigs, and several outbreaks of pleuro-pneumonia, the health of the herds and flocks throughout the State has been exceptionally good.

As you are aware, several changes have occurred in the staff of this Branch. During the past year Veterinary Surgeon Burns was appointed as officer in charge at Fremantle. Mr. Neville, the clerk at Fremantle office, was unfortunately compelled to resign on account of ill-health, and Mr. Davies was appointed to take his place. Mr. Lee was appointed to take the place of Mr. Malcolm, who resigned, and Mr. Gibbons to fill the vacancy occasioned by the transfer of Inspector Taylor to the Lands Department. In the latter gentleman the Branch lost a very valuable officer, though it has been successful in obtaining the services of an inspector to take his place, who, by past experience among stock (particularly sheep), proved himself a thoroughly competent and painstaking officer.

SWINE FEVER.

It is a matter of great regret that swine fever has made its appearance in the State, causing, as it has done, such very heavy losses to an industry which promised to successfully cope with and meet the demands of the State. It has been found impossible to trace the source of its origin, as the disease was not reported by the various owners for some considerable time after its ravages had commenced. It was, however, supposed that the disease was imported with a certain shipment of pigs arriving on the 23rd August, 1903, from South Australia. Those pigs, however, appeared to be in perfect health on arrival, and as many were still alive and were again inspected and found healthy when the disease was first recognised, it is unlikely that the infection was transmitted through this source.

The symptoms of this disease were first exhibited at Mr. Stevens' piggery at Cannington. This was in August of last year; following on which a heavy mortality occurred at a piggery in Bayswater, 95 pigs succumbing to the disease. From that particular period until the present time the disease has continued, though the majority of the losses have occurred in store pigs,

weaners, and suckers; only in a very few instances has death occurred amongst the more valuable class of pigs. It was most prevalent during the month of November, but on active steps being taken by the department it was immediately checked, and with few exceptions no re-occurrence of the disease has taken place. The most recent outbreak occurred at Belmont during last month, and this only in a mild form, that particular piggery being now in a healthy condition.

A total loss of 1,012 head has been reported by the officers of this department, and it is possible that a number of others have died without having been reported.

Every precaution has been taken to check the further spread of the disease, and I am hopeful that, with careful attention to the condition of the piggeries, the disease will in due course be stamped out. One particular good which may be attributed to the outbreak is the improvement that has been effected in connection with the buildings, etc., and the general manner in which piggeries are being kept. Proprietors, particularly in the suburban district, who were very lax with regard to cleanliness, etc., have made considerable alterations to their premises, which will be of lasting benefit in aiding further development of the industry.

A number of deaths have also been reported from the country districts from influenza. This is the result of sudden changes in temperature, chiefly through exposure to cold winds, also careless housing and injudicious feeding, all of which are unfortunately a very common negligence with owners of pigs in the outlying districts.

PLEURO-PNEUMONIA.

During the past 12 months a number of outbreaks of pleuro-pneumonia occurred in the State, chiefly amongst dairy cattle. They were all successfully treated. Amongst four shipments of cattle from Wyndham—one in December of last year, and three others during May of this year—a few cases of the disease were discovered, though the lesions show that the disease was of some few months' standing, with the exception of one or two instances. These cattle originally came from the Wave Hill, Victoria River, and Ord Stations, and although the Inspector at Wyndham has been advised of the discovery, so far he has been unable to obtain further information on the matter. With the exception of about 100 head, which were inoculated before leaving the quarantine grounds, the whole of these cattle have gone into consumption, and (having been slaughtered under the supervision of both stock and health inspectors) were passed, being found free from disease. The fact of pleuro-pneumonia having been discovered amongst stock from the North-West should induce owners to exercise careful supervision with a view of detecting any symptoms of the disease, for should it once obtain a firm footing the mortality which will occur from this cause may be most severe. Wherever the disease

is discovered amongst station cattle, steps should be immediately taken to have the whole herd inoculated.

Where the disease occurred amongst dairy cattle the whole of the herd has been inoculated and the affected animals destroyed. By this means the various outbreaks have been successfully coped with.

TUBERCULOSIS.

Various cases of tuberculosis have come under my notice during the past year. As in the case of pleuro-pneumonia, most of these occurred in dairy cattle, and as the dairying industry is assuming important proportions in this State, it will be necessary for the Government to appoint a qualified officer who will be able to make at least a monthly examination of all dairy cattle, for the purpose of detecting any disease which would prove, through transmission by milk supply, to be injurious to public health, and at the same time prevent infection being spread amongst this class of cattle. All the animals affected with this disease were destroyed and burnt.

TICK FEVER.

Reports to hand from Inspector Haly, of Wyndham, go to show that practically no injury has been sustained by cattle-owners in that district on account of tick fever. The ticks, however, appear to be quite as numerous, if not more so, as in past years, but on account of the season being an exceptionally good one for stock, they seem to have been better able to withstand the ravages of this pest, and are keeping in remarkably good condition.

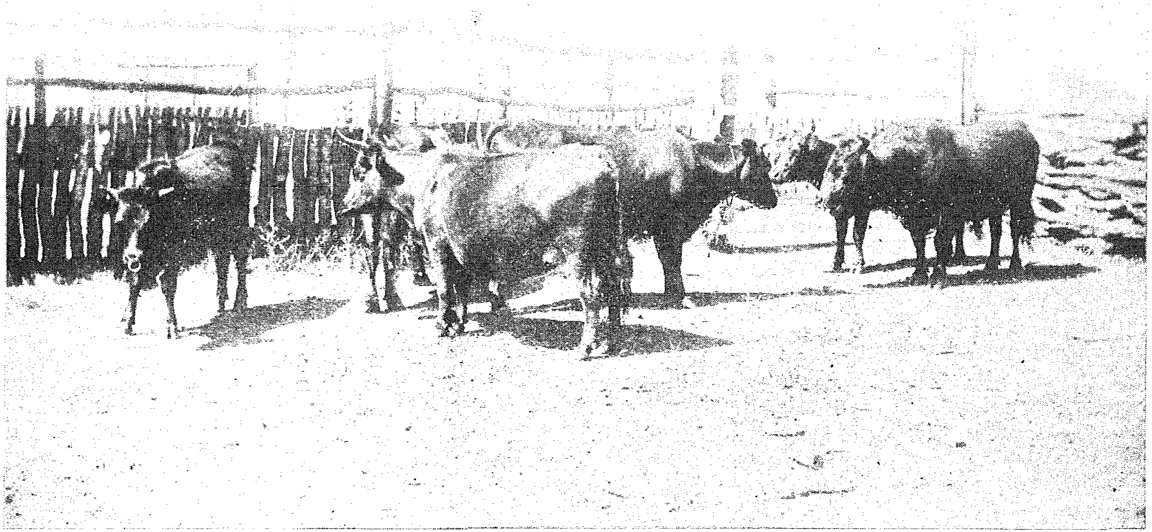
The appearance of cattle arriving from Wyndham, with the exception of those shipped early in the season, is very good, though in all instances they are badly infested with tick. During the latter part of 1903 all the stores contained in the various shipments were treated with the Queensland dip, and two immersions in this solution, with intervals of about nine days, were found sufficient to destroy all the parasites, though the experience gained from the use of this dip shows that it is somewhat severe in its action on the hides, etc., of the animals. Beyond this, from my own personal observation, no injury appears to be resultant from its use, though it is averred by some cattle-owners that it has a deleterious effect on the health of the more weakly animals, but as to this no proof has yet been brought forward which conclusively proves such to be the case. As a result of these complaints, however, the department has been making experiments with other solutions, but so far nothing has been experimented with that gives entire satisfaction. A preparation known as the McKenzie dip has received a very fair trial, over 1,000 head of cattle having been treated, some requiring three and others four dippings before being certified to as clean. Experiments are also being made with the Royal dip, the ingredients of which are very similar to those of the Queensland, one difference being that it is received ready for use, thereby saving the labour of mixing.

EXPERIMENTS WITH DIPS.

Experiments were made with clean cattle placed in tick-infested yards. Two young steers were placed in Messrs. Copley's yards on the 23rd October, 1903, and an inspection was made on the 18th November, 1903, which showed them to be infested with young tick, as a result of which both animals showed a distinct rise in temperature, the feverish symptoms in one being much more severe than in the other. This latter animal fell off a great deal in condition, and on reaching a very weak state died on the 7th December last. A *post mortem* being made revealed the fact that death was due to tick fever. The other recovered and is now in a healthy condition in the yards. Two other clean animals were then purchased and also placed in the yards in February of this year. These two remained quite free from tick until very recently, and only a few have been discovered on the animals, and these not in sufficient numbers to cause any abnormal condition of health, consequently no fever was present. These animals will be kept for experimental purposes for 12 months, so as to conclusively prove what periods of the year ticks are likely to inflict injury in this part of the State, and also if any injury is likely to result from tick being introduced to any portions of the State now free. From the evidence thus gathered, we find that during the winter months very little hatching occurs in that season, the great majority of the eggs being rendered unfertile from the cold and wet weather, thereby showing that even if a number were hatched during the summer months the majority would die off in the winter. Further, the experience gained from tick cattle depastured on the Eastern Goldfields conclusively proves that ticks are not likely to become a pest in that particular portion of the State.

The present quarantine yards at Owen's Anchorage having been found inadequate, arrangements have been made with the Public Works Department for the construction of three additional ones, which will be used principally for the reception and drafting of dipped cattle.

As the production of cattle for the meat supply is materially increasing from the West Kimberley and local sources, it is anticipated that in a very short space of time the demands of the meat markets will be fully supplied from these parts, and it will not then be necessary to further ship cattle from the port of Wyndham, but that abattoirs and chilling works will be erected at that place and an export trade commenced. This, without a doubt, will be of great benefit to the industry generally, and at the same time will do away with the expense and labour occasioned by bringing tick-infested cattle into clean parts, though in the event of trade continuing from the East Kimberley, as at present, it would be advisable to erect proper buildings for the accommodation of shipments of cattle on their arrival here, as under the present conditions they are exposed to the severity of the coastal weather during the winter, and to the severe heat during the summer months, neither



Stud Dexter-Kerries at Chapman Experimental Farm.

of which are conducive to an improvement in condition whilst awaiting slaughter. Reports from West Kimberley go to show that a good season has been experienced, and the stock arriving are in very fair condition and particularly free from diseases.

SHEEP.

The fact of regulations having been brought into force in the South-Western and Eastern Districts for the compulsory dipping of sheep has proved satisfactory to all parties concerned. The work of the inspectors has also been rendered much easier. Dips have been erected in the various centres, and the owners of flocks seem to have recognised the value of dipping, and, without such a measure having to be enforced, have decided to make it an annual event. Early in this year both tick and lice were discovered in the Victoria and Toodyay districts, though in neither instance was the infection spread over a large area. Owing to the lateness of the season and owners of flocks being without the conveniences for dipping, the regulations were temporarily suspended until such time as dips could be erected.

LAMBING.

With the exception of the Ashburton District and the Upper Murchison, the lambing throughout the State will be exceptionally good, averaging from 75 to 85 per cent., and in some districts even exceeding this. The condition of flocks, on the whole, is very good, losses from common occurrences being very slight.

HORSES.

The horse-breeding industry has been much neglected in past years, but the high prices prevailing for all classes of horse flesh should be an incentive to many who are now in the position to cultivate this branch of animal industry to cause a production sufficient for the wants of this State, and in due course give a surplus for export trade, thus preventing the enormous amount expended, especially on draughts purchased in the Eastern States.

In order to encourage this industry, the Government, in my opinion, should take steps to secure suitable sires and have them placed with settlers in the chief farming centres, where their services could be secured at a reasonable fee. By this means an incentive will be given farmers to breed a good class of stock, especially for agricultural purposes.

DAIRYING.

This industry is slowly but surely progressing. Many good animals have been imported during the past year, also many have been successfully reared locally, and a few years such as the past should practically cause importation to cease. The South-Western District, from about Canning to Bunbury, has every appearance of being the dairying centre of this State, and when the swampy country within that area has been effectively drained, a vast area will then be available for growing the necessary grasses and other

green fodder which must be produced, especially in the summer months, for this industry. It has been previously pointed out that anyone desiring to go in for this particular industry should first ascertain the conditions required by the Central Board of Health as to the nature of the buildings to be erected, etc., thereby avoiding additional expense and anxiety to the owner, which has already in many instances been occasioned purely through non-compliance with the health conditions.

GENERAL REMARKS.

Two outbreaks of abortion amongst mares were reported, one in the Greenough and the other in the Canning District. The cause was evidently due in the first case to the succulent nature of the pasture on which the animals were grazing, and in the latter to exhaustion on the part of the sire.

Influenza was prevalent amongst horses in the Southern parts of the State during the winter months, but complete recovery was effected except in a very few instances where the conditions prevailing were unfavourable to recovery, or where animals were kept at work after contracting the complaint.

A number of cattle and sheep were affected with *ophthalmia* in the Eastern District during the extreme heat of summer, but although many of them were afflicted with temporary blindness, they speedily became restored by the treatment applied.

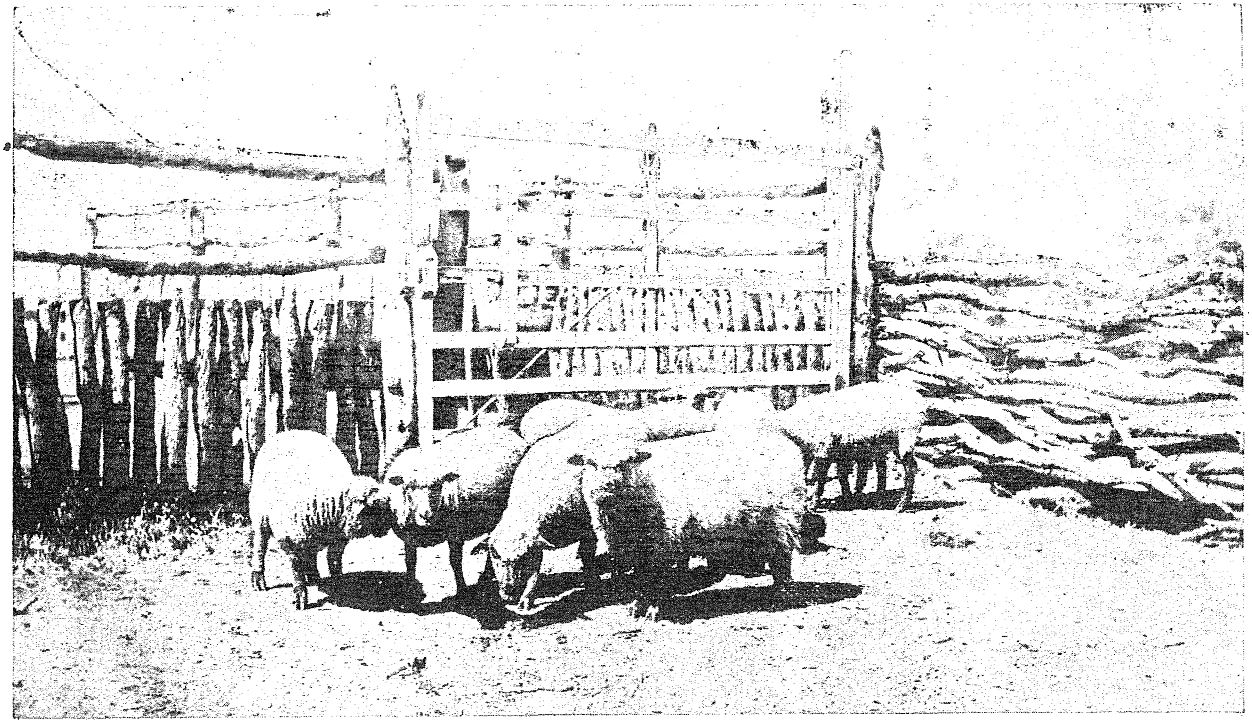
A settler in the Wooroloo District sustained serious losses at the end of last year's *lambing* with small framed Merino ewes, which had been mated to a vigorous Shropshire ram. Crossing, when judiciously carried out, is both commendable and profitable, but care should always be exercised in selection, otherwise such losses will inevitably ensue.

Owing to the early rains this year, losses from *impaction* (which are common in cattle in the latter part of summer) have been comparatively few, and the majority of cases which occurred recovered under treatment.

Slight mortality has occurred from animals eating *poison bushes and weeds.* The "York Road" poison caused mortality amongst some imported cattle travelling by road from Grass Valley to York; and in the Bayswater District some valuable dairy cows succumbed to *Homeria*, a species of poisonous grass which is spreading amongst the pastures in that district. It would, perhaps, be advisable before this latter weed has become wide-spread for the Government to consider the question of its eradication.

ERECTION OF ABATTOIRS.

The work of erecting new Government abattoirs at Owen's Anchorage is now well in hand. Plans have been prepared and tenders are at the present time being called, and it is hoped by this time next year that this very necessary work will have been fully completed, thereby making provision for and facilitating the



Stud Shropshire Ewes and Lambs, Chapman Experimental Farm.

operations of a trade which is rapidly increasing. That such a work is urgently required is apparent, on account of the primitive methods under which the slaughtering is at present carried out, especially in the outlying districts.

STOCK IMPORTATIONS.

The following is a return of stock imported for the year ended 30th June, 1904:—

Port of landing.	Horses.	Fat Cattle.	Dairy Cows and Heifers.	Bulls.	Sheep for slaughter.	Ewes.	Rams.	Pigs.	Dogs.	Goats.	Donkeys.	Poultry.
Fremantle	1,135	6,106	726	255	42,039	5,196	3,077	816	203	42	196	7,690
Geraldton	...	...	3	...	400	...	...	...	4	...	...	20
Esperance	1	...	...	...	...	...	...	...	...	...	...	40
Albany	81	36	11	1	...	...	...	...	13	...	...	380
Wyndham*	255	9,875	...	...	...	...	...	...	...	...	...	...
	1,472	16,017	740	256	42,439	5,196	3,077	816	220	42	196	8,130

* Overland from Northern Territory.

STOCK SHIPPED TO FREMANTLE FROM NOR'-WEST PORTS.

From	Cattle.	Sheep.
Wyndham	16,622	...
Derby	1,573	3,591
Other Ports	70	7,119
	18,265	10,710

FINANCE.

As you are aware, this branch has never been looked upon as a revenue producer, consequently our expenditure each year will be found much in excess of the revenue derived from the few small sources at our command. For the financial year ending 30th June,

1904, the expenditure totalled	£3,499	1	9
while the revenue reached	1,249	1	5
Leaving a balance of expenditure over revenue	£3,150	0	4

From these figures it will be seen that the branch is at present being run on very economical lines, and is comparatively of very little expense to the State. It is, however, anticipated that the salaries items will have to be increased during the coming year by the appointment of at least two other inspectors and another veterinary surgeon, a lot of new country having been stocked during the last few years where at the present time no supervision exists.

R. E. WEIR, M.R.C.V.S.

Annual Report of Poultry Expert.

THE ACTING DIRECTOR OF AGRICULTURE,—In accordance with your request, I have much pleasure in submitting my Annual Report for the past 12 months.

Poultry-breeding is still in a very backward condition in this State, as is proved by the fact that the importations of eggs for 1903 amount to the large sum of £73,538, as against £71,885 for 1902, thus showing a slight increase; the total importations for the past 10 years amount in value to £468,401. The importations of live and dead poultry for 1903 amount to £3,569, against £2,508 for the previous year, and the importations under this heading for the past 10 years amount to £27,585, making the grand total of imported poultry products £495,989 for the past 10 years; but as these figures are the values at port of export, the actual amount reaches considerably over half a million sterling.

REASONS WHY POULTRY NEGLECTED.

The good prices which the staple products, such as chaff and wheat, have been fetching has been one of the chief reasons why our farmers have neglected poultry, but now that the prices of grain and hay are on a level with the Eastern States, the raising of fowls must in the near future receive greater attention. Another reason why so little attention has been given to poultry-raising is owing to want of knowledge in the details of management. Active steps are

Allora Spring Wheat, grown at Chapman Experimental Farm, Victoria District.

being taken to meet the requirements in this respect by spreading information in every possible manner.

DISSEMINATION OF INFORMATION.

Articles on poultry appear in each issue of the Department's *Journal.* A bulletin on the subject has been issued and 5,000 copies distributed, and another and larger one is now available for free distribution. A bulletin especially dealing with the tick pest has just been printed and is also now available. Fifty-one lectures, illustrated with lantern views, have been delivered in various parts of the State during the past 12 months to about 3,500 persons, giving an average attendance of 70 per lecture. Over 400 farms and poultry yards have been visited in the country districts, and 34 special visits have been paid to poultry yards in Perth and suburbs *re* disease and poultry management. Fifteen country poultry and agricultural shows were visited, at 10 of which the writer judged the poultry classes. A large number of persons were personally interviewed at every show, and advice is given daily, both personal and by letter, at the Department at Perth.

TICK REGULATIONS.

Special regulations have been framed dealing with the tick pest, and are being enforced as well as time will allow. Over 100 yards were found infected and quarantined in the small area of Perth and suburbs which I found time to inspect. Special tick inspection visits were made down the Great Southern line as far as Albany, also to Bunbury, but to properly attend to the work of tick destruction assistance is required.

FOWL TICK IN AUCTION ROOMS.

Special attention has been paid to the auction and dealers' premises of Perth, as they are recognised as one of the great mediums of spreading poultry tick. Almost every place was found infected, some of them very badly, but great improvement has been effected in these premises; as all wooden coops and pens have been done away with, and nothing but coops made entirely of iron are permitted to be used, so that no harbour is provided for the pest, and it would now be a very difficult matter to find tick in any of the auction or dealers' coops.

THE SALE OF DISEASED FOWLS.

The selling of diseased poultry at the dealers' and auction rooms in the city is being vigorously dealt with; the sale and dealers' rooms are inspected every morning when the writer is in town, and all fowls found badly diseased are taken out of the coops and burnt. Since this work has been commenced (some two or three months ago) about 50 fowls have been destroyed as unfit for human consumption.

MODEL POULTRY FARM.

The need of a Model State Poultry Farm within easy access of Perth is urgently required; it would act as an object lesson, and would eventually be self-supporting from the sale of stock and eggs, for which there is a strong demand.

MARKET PRICES.

The prices realised for both eggs and fowls for the table show that poultry-raising is a very profitable industry in the State, as per the following quotations of prices in the Perth wholesale markets. Eggs 1s. to 3s. per dozen, average price 1s. 10d.

	Minimum Average per Pair.	Maximum Average per Pair.	Mean Average per Pair.
	£ s. d.	£ s. d.	£ s. d.
Ducks	0 6 5	0 8 10	0 7 2
Fowls	0 4 6	0 7 5	0 5 11
Geese	0 13 0	0 14 7	0 13 9
Turkey gobblers	1 0 9	1 5 9	1 3 3
Turkey hens	0 10 3	0 14 1	0 12 2

Those farmers who always send in good birds and study the markets would naturally get the high averages, and if poultry were sold by weight the result would be more satisfactory to the raisers of good stock. This could be done by marking the weight of fowls on the crates of all poultry consigned to the markets.

30th June, 1904. FRANK H. ROBERTSON.

The Annual Report of the Secretary of the Rabbit Department.

THE ACTING DIRECTOR OF AGRICULTURE,—As regards rabbit incursion and prevention during the year 1903-4, I have the honour to report as follows:—

The very favourable season experienced has had the natural result of largely aiding the increase and advance of the rabbit pest. This increase has been very marked during the 12 months under notice, evidence of the presence of young rabbits being abundant in places, and all rabbits captured have been reported to be in highly thriving condition. Several cases of deaths, apparently from the poison plant, have been observed, but, as was anticipated,

Wheatfield, Chapman Experimental Farm.

the poison plant has not proved an effective safeguard; and even where it is most prevalent, in the vicinity of the coast, its failure as a destroying agent is shown by the fact that the largest captures of live rabbits have been made in this part. To meet the advance of the pest, the following three fencing contracts have been in progress during the year, namely:—H. Cocking's contract No. 3, of 145 miles; J. F. Dwyer's contract No. 4, of 125 miles, and J. F. Dwyer's contract No. 4, of 100 miles.

Information reached the office that the first of these (Contract No. 3) would be completed in October, 1903; and, authority having been obtained, I left Perth during that month to inspect the same, and other works. The inspection showed that the contract had not been carried out as required; and, as a result, the hon. Minister ordered the dismissal of those officers under whose supervision the fence had been erected, and directed that the further work of fence construction should be placed in the hands of the Public Works Department. When this change of control took place, the fence was erected from the sea on the South, to some 150 miles North of the Goldfields Railway line—in all something over 365 miles; though only 95 miles of this had been passed by the Department. Erection was also in progress for 100 miles farther North.

By arrangements made with the Mines Water Supply Department, wells and bores were being sunk along the fence line through the most waterless portion of the country Northwards of the Goldfields Railway line. Work of this nature had been completed at 126-mile, 163-mile, 183-mile, and 198-mile, when the change in the control of the work was made, and the Water Supply party was withdrawn. The above supplies, however, proved of inestimable value to the contractor engaged in fence erection along that portion.

Along the line South from Burracoppin, the work of excavating tanks, etc., has proceeded steadily by casual labour under the Department, and is now so far advanced that there is no likelihood of any difficulty arising from shortage of water along this end during the coming summer. Towards the latter portion of the past summer, boundary-riders were in some cases compelled to relinquish their posts, owing to the water giving out, and the work of tending the fence was carried out with difficulty. Any repetition of this has now been averted as far as the Southern 200 miles is concerned.

As a result of the inspection made of the Southern fence line in the month of October, a deviation was decided upon in the fence where it enters the sea at Starvation Boat Harbour, as the old entrance was by no means secure, especially at low tide, and the netting was continually being washed out of position and torn about by the seas. The new sea entrance, now several hundred yards to the Westward, is much more effective, being rabbit-proof even at low water, and is only liable to injury during unusually rough Southerly weather.

As the contractor failed to complete the fence erection (No. 3 Contract) within many months of the period allowed him, the length of time during which the gap between the railway line and the sea remained open had the unfortunate result of allowing numbers of rabbits to get through to the Westward before the barrier was closed against them. (This danger was foreseen by me when, in September, 1902, I suggested erecting the fence along a line much farther to the Westward.) To cope with this incursion a special officer was appointed by the hon. Minister, with a staff of rabbiters equipped for the purpose of extermination, and whose operations have been proceeding ever since.

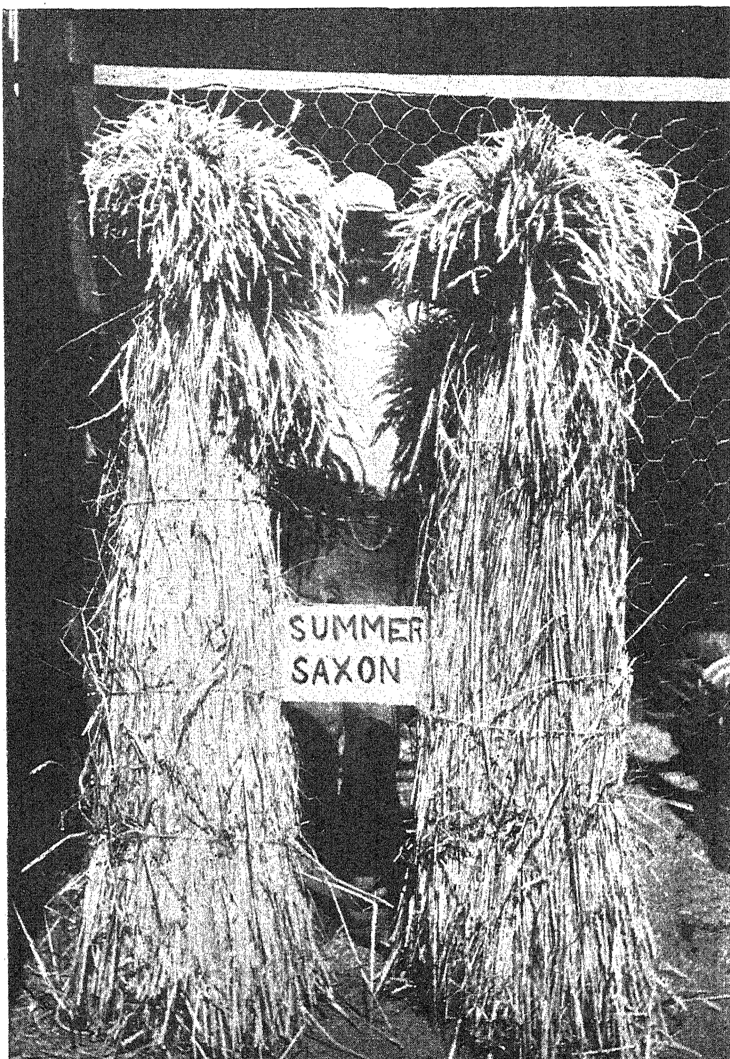
The onward march of the rabbits from the Eastward is evident from the increasing indications of their presence all along the fence for hundreds of miles; but as yet they do not seem to have settled down in any special localities; and although they take temporary possession of dulgite holes occasionally, they have not yet attempted to establish themselves in warrens; but shift from place to place—usually working along the fence towards the North. They are being caught in considerable numbers by the boundary-riders, part of whose duty it is to harass in every way—by trapping, poisoning, digging out, etc.—any rabbits which are found to be present along any portion of their lengths.

It would almost appear as though the rabbits reach the fence in greatest numbers *via* the coast-line and the goldfields railway line, moving from these points Northward. During the last quarter of the year 22 rabbits have been captured in the yard-traps within 40 miles of the coast; while the number caught in these yards diminishes as you go Northward. In like manner, 11 bodies were found of rabbits poisoned in one night at a spot nine miles North of the railway line. This is the largest number so far destroyed at any one place in so short a time.

As 370 miles of the fencing placed in the hands of the Public Works Department for final completion is still under their charge, the work of maintaining this portion is not yet being wholly undertaken by boundary riders; men are, however, being put on with lengths allotted to them covering the whole 465 miles erected, for the purpose of preventing any possibility of the passage of rabbits, or any deterioration of the work done, pending its coming entirely under our control. A time-table for the regular patrol by these men of the whole distance has been made out, and means of conveying supplies to them regularly by camel carrier have been instituted.

H. M. WILSON,
Rabbit Branch.

18th October, 1904.



Rye grown at Chapman Experimental Farm.

Government Refrigerating Works.

ANNUAL REPORT, 1903-4.

THE ACTING DIRECTOR OF AGRICULTURE,—I have the honour to forward, for your information, the 7th Annual Report of the business transactions at the Government Refrigerating Works.

1. The stores were re-opened on the 22nd July, 1903. It was decided to take the risk of running the machinery throughout the year, and not to close the stores as formerly in May. The period embraced in this report is therefore from 22nd July, 1903, till 30th June, 1904—or almost 12 months, as against 10½ months in the previous report.

2. The general stores have been fairly well occupied, and the returns are much the same as usual. In the absence of a speculative market in butter, and the scarcity of fish prevailing all year, the stocks have not generally been heavy. The accommodation reserved for this business has been capable of earning more money.

3. The retail stores, although ready in July, were not well leased till far on in September. From September till May these stores were mostly all leased, and at times requests were made for more accommodation of this kind, but mostly of a temporary character.

4. The retail and general stores are the least remunerative, entailing perpetual attendance and a vast amount of extra work for the machinery. There has been a marked improvement in the care taken by retailers of their goods stored in these stores, no doubt attributable to the frequent visits paid by the Chief Inspector, Local Board of Health, and the penalties attached to exposing for sale, or storing, meat not in good condition. This remark applies to the fish stores also. Still the utmost vigilance is required to prevent owners from spoiling their goods through carelessness, wilfulness, or ignorance.

5. The wholesale stores have been exceptionally well occupied. As stated in my Report, 1902-3, it was then anticipated that a large importation of frozen meat would take place this year, and the expectation has been fully realised. The stores have been in constant use, and as late as May I had to refuse a consignment of 3,000 carcases because the stores then were all in use. It is

from this source that the Department must look for a steady and profitable revenue to meet the heavy expenditure entailed by the mixed class of business I control.

6. The revenue from ice has also increased. The greater freedom of sale given to me and the increased quantity taken by the Railway Department are the main reasons for this. It was hard work supplying the regular customers during the hottest weather, and frequently I had to refuse orders for three and five-ton lots. The refusals arose, of course, from the limited storage accommodation and the general sale being larger than could be provided for.

7. The annual revenue forms the highest amount that has been received since the works were opened in 1897. In 1897-8 some £2,500 was received, chiefly from frozen meat storage. That Frozen Meat Co. gave up business, and the revenue fell off greatly in the two following years, since when it has gradually been increasing till it has reached its present point.

8. The annual expenditure is also a little more than last year. On account of the frozen meat business, beginning in July and keeping on right up till June, the machinery ran longer hours and the electric light consumed was more. An extra man had to be employed in the engine-room, and an assistant obtained for the storeman, who was unable to cope with the work.

9. A complete statement of revenue and expenditure and a comparative statement are attached hereto.

10. The consignments received for storage were much the same in character as in former years—the bulk being imported produce. Last year I reported a large increase in the quantity of fresh meat passing through the stores in wholesale quantities. This year the frozen meat assumes predominance, and at times there have been up to 6,000 carcases, besides beef, rabbits, veal, etc., in the stores. All the consignments received here in good condition have been redelivered to owners without loss or damage or any claim being made against the department. In addition to the consignments stored under lease, there have been over 17,000 packages passed through the stores as individual consignments. These entail a large amount of clerical and other labour for a very small return.

11. The machinery has worked very satisfactorily, and there has been no mishap of any kind necessitating stoppage for long.

12. The moisture in the passages has been kept at a minimum. The machinery having been running double shift all the time has prevented much moisture, and the assistant storeman has removed any moisture as it arose from the unavoidable opening of doors when the stores were being used.

13. The staff has rendered a very willing service throughout, and without this it would be impossible to have the work done carried on. I would remind you that civil service hours, civil service salaries, or civil service conditions of labour do not prevail

here; and strongly recommend that the Department should recognise these services by some token that best can be appreciated, viz., by increasing the payment for these services, which is none too good at present.

14. The Government Refrigerating Works, being a public institution, cannot hope to escape criticism, and rightly so; but there is criticism which is helpful and criticism which is hurtful, and of the latter sort I had more than enough for some months during the year under review. This kind of criticism appearing in the public Press, with the impress of the Department upon it, causes a severe strain on the loyalty of the staff, destroys all enthusiasm in the work, creates unrest and dissatisfaction in the minds of the lessees and others, and thereby is hurtful to the revenue. Fortunately for me I have lessees of six years' experience who know how they and their consignments have been treated, and who take no notice of this kind of criticism, but I want new trade as well as keep the old. No business can be knocked about in this fashion and grow. It would be easier for me to side with complainant when these uninformed criticisms are made, but while I am in the pay of of the Department I will be found acting for defendant. It is only necessity that compels me to write this paragraph, in the hope that this kind of criticism will be stopped by the Department at any time that it may arise, as I am not personally permitted to refute it as publicly as it is made. It may not be out of place to add that since you became Director there has not been any recurrence of this sort of thing, and the staff here appreciates the change.

15. The necessary repairs and overhauling of machinery and stores are being proceeded with as opportunity serves, as the stores will not be closed nor the machinery stopped at the end of May, as in former years.

16. The new erections on hand are:—A new ice plant for making a pure ice supply; two new ice stores to provide sufficient storage to carry supplies through the hottest weather and to utilise the machinery during the coolest months, in order to save it for the stores in summer; Store 4, being too large and rarely used, is being subdivided into two more suitable stores with storage accommodation for about 1,500 carcases; additional cooling area is being added to Stores 3 and 11, to make them useful for storing any kind of produce; and an enlarged coal bunker has been completed.

17. Looking back over the year, and remembering all the conditions attached to the very mixed business done, the results obtained by your staff here, for the department, should I think be considered very satisfactory.

18. In the near future there are several items which will require consideration. The most pressing of these is the machinery water supply. Besides being very objectionable at times, the water in the Claisebrook drain, I hear, is likely to be cut off soon, and it would be out of the question to rely on the metropolitan supply,

because of the expense. Neither could a well on the premises be relied on to give the quantity required. The only thing that I can recommend is that our present well should be cleaned out and cemented inside, and a small bore put down through it. By referring to the Public Works Department, I believe you would obtain data as to the feasibility of this proposal, and an estimate of expenditure.

19. There being now four frozen meat importers using the stores, the unloading arrangements are inadequate if this business continues and is likely to grow, as in my opinion it will. Instead of a single line in the siding, a double line of rails is necessary, with another platform. The stores upstairs should be cut off entirely from those downstairs, so that when only one portion of the building is in use the whole should not be opened up as at present. This entails the removal of the stairs, the institution of lifting rails from both platforms to the stores upstairs. I do not think it would be necessary to remove the present lift, as it would always be required, but a movable roof-hatch should be put in.

20. The removal of the market refuse depôt has, for a long time, been very desirable, because of its proximity to the stores. The space between the markets and the works should be covered in to form protection to the stores when "road" consignments are received or delivered. The painting of all the building outside, and the renovation of the guttering all round, requires attention now, and the question of fire-extinguishing apparatus should again be raised.

21. When I framed the lease forms I intended that they should divest the Department of all responsibility, except for negligence of its officers, in connection with goods stored here. Last year these forms were again revised by the Crown Law Department for this purpose, but legal decisions are so uncertain that I offer for your consideration the advisability of having a floating insurance policy of some sort, to cover damage of any kind to the different classes of produce which may be stored here from time to time. Although for the past seven years no claims for loss or damage have been made, it is too much to hope that in work of this nature the Department will always be so fortunate.

I have completed this report and send it to you at this early date so that any information it contains may be considered by you. I think that nothing will arise requiring to be embodied, but if there should I will forward it with the cash and statistical statements at the close of the financial year at 30th June, 1904.

JONATHAN GRESHAM,
Manager.

20th May, 1904.

1903–1904.

	£	s.	d.
REVENUE COLLECTED AT THE OFFICE OF THE GOVERNMENT REFRIGERATING WORKS AS PER CASH BOOK, AUDITED TO DATE—			
(1.) Rents	2,428	12	9
(2.) Storage	491	15	7
(3.) Ice	746	14	7
	£3,667	2	11

OUTSTANDING ACCOUNTS—

	£	s.	d.
Department of Agriculture	10	1	3
Railway Department ...	12	0	0
R. W. Hardey	3	2	2
Explosives Department ...	0	14	6
Perth Hospital	4	0	0

	£	s.	d.
Outstanding Accounts	26	1	11
	£3,693	4	10

NOTE—

	£	s.	d.
(1.) Increase for 1903-4 ...	906	11	10
(2.) do. ...	2	1	0
(3.) do. ...	226	0	2
Total increase	£1,134	13	0

for 1903-4

1903–1904.

	£	s.	d.
EXPENDITURE AS PER VOUCHERS PASSED FOR PAYMENT AT THE OFFICE OF THE GOVERNMENT REFRIGERATING WORKS—			
Salaries and Wages (Office and Stores)	607	9	6
Salaries and Wages (Machinery Department)	1,023	11	4
Coal	571	18	8
Freight	379	2	10
Electric Light and Upkeep	214	13	4
Gas Company	46	18	9
Sanitary Service	5	0	0
Water	22	16	7
Calcium	37	11	11
Compound	20	5	0
Oils	77	5	2
Leather	6	19	6
Ice Delivery	27	5	9
Miscellaneous: Additions, Alterations, Repairs, Requisites	283	10	10
Report on Machinery and Stores by letter, from Messrs. Mullaly and Byrne, Baggage Agents, Melbourne	10	10	0
	£3,334	19	2

	£	s.	d.
DEDUCTIONS FOR STOCK AVAILABLE for 1904-5—			
Coal...	30	0	0
Gas	12	0	0
Calcium	9	0	0
Leather	7	0	0
Oils	13	0	0
Compound	1	10	0
Miscellaneous: Wastes, Packing, etc.	1	10	0
	£74	0	0
ITEMS PAID FOR BUT ONLY PROPORTIONATELY CHARGEABLE TO 1903-4—			
Electric: Re-wiring Works	56	0	0
Extra Coal Bunker ...	46	7	3
Pump	10	0	0
New Grids, etc.	20	0	0
New Ice Plant	92	10	0
	£224	17	3

See Explanatory Note below.

JONATHAN GRESHAM,
Manager.

1st July, 1904.

EXPLANATION REGARDING A FEW ITEMS OF EXPENDITURE.

The increase of £64 in the salaries and wages item "Office and Stores" is caused by assistance required in the stores. Even with this assistance it is very hard work meeting the demands made upon the storeman. The increase in the engine-room salaries and wages amounts to £206 1s. 4d. The reasons for this are these, viz.: While the works were closed last year, intimation was given to me that a large consignment of frozen meat would arrive earlier than was expected. The engineer informed me that he could not possibly overhaul and repair the machinery in time to receive this consignment, and I obtained approval for extra assistance to be given to him to complete the work. Further, the machinery has been running continuously double shift, with an extra pump shift during the hottest weather. This meant an extra man, for which I got approval. The works have not closed this year, and during the men's holidays one man's work had to be duplicated by keeping a relief man.

The increase of about £200 in coal and freight is explained by the continuous running of the machinery for a very much longer period than formerly.

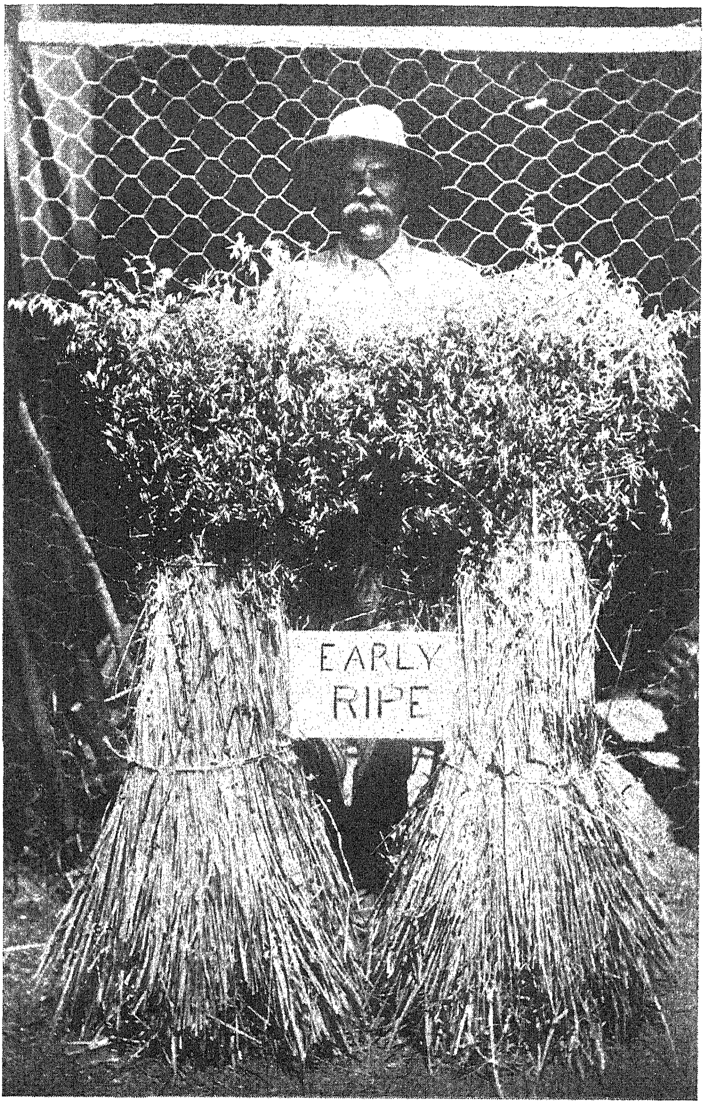
The night work in the stores has much increased on account of almost weekly shipments of frozen meat. This, with the extra work in the engine-room, explains the increased expenditure for light.

The expenditure under "Miscellaneous" is satisfactory when the mixed business is taken into account, and I will see that any increase arising in any of these items is justifiable, besides, as hitherto, enforcing economy wherever possible.

The increased expenditure for water was caused by the frequent interruption to our machinery supply flowing through railway goods yard and under care of Railway Department.

JONATHAN GRESHAM,
Manager.

1st July, 1904.



American Early Ripe Oats grown at Chapman Experimental Farm.

1903-1904.

SOME COMPARATIVE STATISTICS.

	1902-3.	1903-4.	Increase.	Decrease.
Revenue as per cash book	£2,532	£3,667	£1,134	...
Rents as per cash book	£1,522	£2,428	£906	...
Storage as per cash book	£489	£491	£2	...
Ice payments as per cash book	£520	£746	£226	...
Large Ice stored	2,430 blocks	4,066 blocks	1,936 blocks	...
Small Ice stored	3,250 blocks	5,114 blocks	1,864 blocks	...
Large Ice supplied to Government Departments	7 blocks	62 blocks	55 blocks	...
Small Ice supplied to Government Departments	2,810 blocks	3,860 blocks	1,050 blocks	...
Large Ice to Railway Department	140 blocks	424 blocks	284 blocks	...
Value Ice to Railway Department	£21	£63 12s.	£42	...
Ice supplied to Vineyards	124 blocks	136 blocks	12 blocks	...
Cost of Water	£10	£23	£13	...
Cost of Ice delivery	£20	£27	£7	...
Freight paid to Railway Department	£240	£380	£140	...
Coal Receipt	709 tons	1,091 tons	382 tons	...
Number of Delivery and Cash Receipts written out, exclusive of files, memos., accounts, and miscellaneous records	19,900	27,000	7,100	...
Cases of Butter stored	8,840	12,000	3,160	...
Number of Packages received, delivered, noted, and stored, exclusive of consignments stored under lease ...	12,500	17,000	4,600	...

JONATHAN GRESHAM,
Manager.

1st July, 1904.

DALGETY'S MONTHLY REPORT.

Messrs. Dalgety & Co., Limited, report as follows in connection with their daily produce sales, held at Perth and Fremantle, for the month ended 4th November, 1904:—

Wheat.—London market is steady at 32s. 6d. per quarter of 3,480lbs. C.I.F. Melbourne and Adelaide markets are quiet at 3s. 6d. to 3s. 7d. per bushel.

W.A. Wheat.—Holders of last season's wheat are now showing more desire to sell than was the case a fortnight ago. Farmers in the York and Northam districts were standing firm for 3s. 4½d. to 3s. 5d. per bushel, but recently some business has been transacted at a shade under these prices, although the majority of growers are still asking for the higher rates. In all probability there will be a fair quantity of last season's wheat to carry over, and now that new season's wheat should shortly be available, the general tendency of the market is easy. It is reported that some sales of new season's wheat for forward delivery have been made at prices ranging from 2s. 2d. to 2s. 3d. per bushel f.o.r. country stations. Perth and Fremantle markets at the present time, offer very little or no inducement to sellers, as stocks at these centres are still fairly heavy, and prices are ruling at 3s. 7d. per bushel for prime milling, and smutty wheat is irregular at from 3s. 3d. per bushel upwards. It is estimated that there is sufficient wheat at Perth and Fremantle to keep these markets supplied for another fortnight, and whilst the position remains thus it is unlikely that values at these centres will improve. We would not recommend consignments at the present time, unless sellers are prepared to accept the last-named quotations.

Algerian Oats.—One or two parcels of local Algerians have changed hands. We placed privately one line of very prime Algerians at 2s. 6d. per bushel, which price was exceptional, but was quite in line with the quality of the sample. Oats of this quality are very scarce, and in good demand for racehorse feed. Ordinary feed lines, however, are selling slowly. The bulk of the orders for oats are still being filled with Algerians imported from Melbourne, which market is firm at 1s. 5d. per bushel, and these oats are selling at Fremantle at 2s. 2d. to 2s. 5d. per bushel, f.o.r. Algerian oats are likely to be dull for another five or six weeks, and we would not recommend farmers to consign ordinary feed lines to Perth or Fremantle markets for auction. The demand for locally-grown feed Algerians should improve after Christmas. However, should any grower have an extra prime sample of Algerians, free from wheat and of good colour, it would be best for them to send us small samples so that sales could be arranged privately. There are very few New Zealand and Tasmanian white oats on spot at Fremantle, and merchants have experienced some difficulty in filling orders.

Straw.—No consignments forward to auction recently. We sold about 30 tons of straw at prices ranging from £2 to £2 5s. per ton. Although this line is in good demand, we would not recommend growers to consign to auction, it being more preferable to sell same privately before loading at rail. There is still a good demand, and the present should be a fair opportunity for growers to sell.

Hay.—The market for stock feed is very quiet, and very little business is being transacted. We sold about 15 tons at from £3 7s. 6d. to £3 10s. per ton.

Manger Hay is in fair demand from £4 10s. per ton. A special good line of manger hay would probably realise more money.

Chaff.—Up to 2nd November, supplies for some time had been very light at Perth and Fremantle, but on that and succeeding days the arrivals have greatly increased. Fortunately, these markets have been lightly stocked for some time, and in a position to absorb fair quantities of chaff. Also, with the green feed drying up, the consumption of chaff should increase, and this should assist the markets to cope with increased supplies, which most likely will come forward from now on. Last week the position at Fremantle with regard to supplies was very acute, some shippers to the North-West experiencing difficulty in filling orders for execution per s.s. "Paroo," which sailed on 4th inst.

Ruling rates are as follow:—

Prime green wheaten, extra quality (supplies limited), good demand from £4 5s. to £4 10s. per ton.

Fair average quality (sound, even sample), moderate supplies from £4 per ton upwards.

New season's wheaten sells readily at £3 10s. to £4 10s. per ton, according to quality and condition of sample.

Some of the new season's chaff from Meckering that is arriving has a heavy proportion of brown flag showing, and this class of chaff is in fair demand at £3 12s. 6d. per ton.

Medium wheaten (last season's), fair demand at £3 5s. per ton upwards.

Inferior wheaten, from 30s. per ton upwards.

Extra prime oaten (well cut) now forward, nominal value from £4 7s. 6d. per ton (good demand).

Good quality oaten, fair supplies forward (good demand), from £3 2s. 6d. to £3 10s. and £3 15s. per ton.

We sold one truck of new season's chaff from Waeel at £4 10s. per ton. This, however, was top price obtained during the week for new season's chaff, and could not be regarded as standard value.

Supplies are now being drawn chiefly from—

Last season's wheaten: Newcastle, Beverley, York, Green Hills, Northam, and Grass Valley.

Last season's oaten: Katanning, Northam, and Newcastle.

New season's chaff: From Meckering and Waeel.

Values at Fremantle will probably remain unchanged for about another week, but beyond that period it is difficult to forecast, as (in conformity with former years) most likely growers will be sending new season's chaff to market more freely, and when the consignments have relieved the short market, values must ease. This position, however, should not be very long in righting itself, as growers this season do not seem anxious to sell, excepting at full market rates, and a glutted market at Perth and Fremantle would result either in drawing heavier supplies to Kalgoorlie or a heavier reduction in the loadings. We would remind senders of new season's chaff of the dangers of over-heating; therefore, it is highly necessary that new season's chaff be bagged loosely, and not loaded too heavily into the trucks.

We estimate that for the month of October the arrivals of chaff to Perth and Fremantle amounted to in all 2,056 tons, of which we handled 690 tons. These centres distributed and consumed approximately 1,942 tons during October. The aggregate stocks on 31st October were 138 tons less than at the end of September, the stocks at Perth and Fremantle on 31st October totalling approximately to 563 tons, of which very little is prime, the bulk consisting of medium quality only.

STOCK AND STATION REPORT.

NARROGIN.

We held our monthly stock sale at Narrogin on Wednesday, 19th ult., when there was a small yarding, buyers and sellers holding off for the special sale on 4th November, the day after the show, when there will be a yarding of about 2,000 sheep and lambs, 100 head of cattle, horses, etc.

The following prices were realised:—

Sheep.—Fat ewes, to £1 1s.; fat lambs, 12s. 6d.; store ewes, 19s.

Horses.—The demand for horses was quiet. Draughts sold at from £25 to £50; light horses, to £16.

Poultry.—Fowls, to 5s. per pair; ducks, to 6s. 6d. per pair.

We had a very successful sale at Katanning on Friday, 21st, when there was a big yarding of cattle and horses submitted. Following were the prices realised: Milch cows, £9 15s. to £12; store steers, £5 17s. 6d. to £7 5s.; store heifers, £6 18s. to £7; slips sold at 17s.; light horses, £7 to £18; medium draughts, to £23.

BEVERLEY.

We held our usual monthly sale at Beverley on Thursday, 27th ult., where there was a very fair yarding of stock and a good attendance. Sales were as follow: Fat lambs, from 11s. to 11s. 4d.; store sheep, off shears, 15s. 3d. Owing to the wide difference of opinion as to the value between buyers and sellers, no fat sheep changed hands. Pigs: There was only a small yarding of pigs. Porkers sold at from 25s. to 30s. Horses: Heavy draught horses realised from £37 to £52; medium draughts, from £26 to £34; light horses, from £7 10s. to £15.

KALGOORLIE.

Chaff.—During the past week supplies have been exceedingly light especially as regards prime qualities. The demand throughout the week has been fairly consistent, especially for good to prime qualities, which are readily quitted, but mixed and irregular grades are slow of sale. There is an excellent inquiry to-day, the siding being very bare of supplies. Closing rates are as follow:—Prime green wheaten, £5 5s. per ton (excellent demand); extra quality wheaten would probably realise £5 7s. 6d. per ton, but there is none available; good quality wheaten, £4 10s. to £4 15s. per ton (fair sales); mixed and inferior grades ranging from £3 10s. to £4 5s, according to quality.

HIDES, SKINS, TALLOW, ETC.

Messrs. Dalgety & Co., Ltd., report having held their usual weekly sale at Fremantle on Friday, November 4.

Wool.—A mixed assortment was presented to a full attendance of buyers; brisk competition ruled throughout, and values were firm at late rates. Merino fleece, good quality, to 9d.; do., medium quality, 7¾d. to 8½d.; do., inferior, 6¾d. to 7½d.; do., goldfields, 6d. to 6½d.; lambs', 5½d. to 6½d.; bellies and pieces, 3½d. to 4¾d.; locks, 1d. to 2d.

Sheepskins.—Average supplies were submitted, and all full-wools met a ready sale at quotations, and shorn pelts, which now comprise the greater portion of our offerings, were in keen demand, especially for lines in sound condition, values received showing a rise of ¼d. per lb. Super merino to full-wool, to 7½d.; good merino, three-quarter to full-wool, 7d. to 7¼d.;

medium, 6¼d. to 6¾d.; good merino, quarter to half-wool, 5¾d. to 6¼d.; medium, 4¾d. to 5¼d.; fine crossbred three-quarter to full-wool, 6¾d. to 7d.; fine crossbred half to three-quarter wool, 5¼d. to 6¼d.; medium three-quarter to full-wool, 6¼d. to 6¾d.; coarse cross-bred, 6d. to 6¼d.; pelts, 4d. to 5d.; lambs', 5d. to 5¾d. In all cases where pelts of above are sun-dried, weevil-eaten, torn, or perished, prices are from 1d. to 2d below quotations.

Hides.—Only a moderate offering was brought forward at to-day's sale; competition was easier, dirty and badly-pressed lines mostly were affected, and for these a fall of 1s. 8d. per lb. must be quoted. Heavies (special), none forward; heavies, 4¼d. to 4⅜d.; medium and light, 4¼d. to 4½d.; dry, 4d.; damaged and cut, 3d. to 3½d.; ticky, 3¾d. to 4d.

Tallow.—This market, in sympathy with the latest reports from London and the Eastern States, is lower by 6d. to 1s. per cwt. Good mixed (in casks), to 19s. 6d.; medium, mixed (in casks), 18s. to 18s. 6d.; inferior, 17s. to 18s.; tins and oddments, 16s. to 17s.

Kangaroo Skins.—These were in small supply and of inferior description, the values received showing no alteration from those lately ruling. Blue Skins—¾lb. to 1lb. average, 2s. to 2s. 6d.; to ½lb. average, 1s. 4d. to 1s. 6d.; extra heavy and light weights, 1s. 9d. to 2s.; damaged lines, 1s. to 1s. 10d.; brush kangaroo, 1s. to 1s. 3½d. Red Skins—¾lb. to 1lb. average, 2s. to 2s. 5d. (nominal); to ½lb. average, 1s. 3d. to 1s. 4d.; extra heavy and light weights, 1s. 9d. to 2s.; damaged lines, 1s. to 1s. 3d.; euro skins, 1s. to 1s. 7d.

Horns, Hair, etc.—In the absence of supplies, we quote these nominally. A keen inquiry exists for all descriptions. Horns, large and fresh, 30s. to 38s. per 100; small and fresh, to 10s. per 100; stale and perished, to 5s. per 100; very small, to 1s. per 100; rough bones, to 3s. 6d. per cwt.; horsehair, to 1s. per lb.; cowhair, to 5½d. per lb.

NOTE.

NEW SEASON'S PRODUCE.

After harvest the next most important part of a farmer's business is to successfully market his produce. We invite growers to correspond with us on the subject of market information, our wish being to assist farmers in this direction. We are, perhaps, in a better position than most others to supply reliable information, because we have well organised and long established businesses at Perth, Fremantle, and Kalgoorlie, at which centres sales of chaff and other produce are conducted daily. In addition, we have a number of branches in other parts of the State, and consequently are in a position to place local produce in quarters which might be inaccessible to us if we were doing business in Perth and Fremantle alone. We would remind settlers that we are not speculators or buyers of chaff or hay in the stack, therefore it is to our interests at all times to give clients best market information and to return highest rates obtainable. Our auctioneers protect produce to its full value, and account sales with settlements are rendered immediately we are in a position to do so. We are always willing to send a grower any information at our disposal. Send your sample of chaff and grain to us for our inspection. Sample bags on application.

GARDEN NOTES FOR DECEMBER.

By PERCY G. WICKEN.

At the time of writing these notes the season promises, especially in the Southern districts, to be a very late one, and and although we have now reached November, we have so far experienced no hot weather; in fact, the weather still continues showery and the wind quite wintry. The rainfall for the season has been considerably above the average, and the ground, especially in the undrained parts, still remains wet and cold, which consequently delays the growth of all kinds of vegetables, and will cause the supply of all kinds of spring and early summer vegetables to last much longer into the summer months than is usual. A few seasons like the one just passed will help to bring forward to those who undertake garden work, both for pleasure and profit, the necessity of draining the subsoil if successful results are to be obtained. By putting in a system of subsoil drains, the surplus moisture is very easily carried off, the ground becomes warmer, and the plants make much more rapid growth and mature sooner; also the drained ground, when well worked, retains much more moisture during the dry weather, and enables other crops to be grown during the summer which it is impossible to grow on undrained land.

Well-drained land enables the crops to mature earlier, and the plants are much freer from attack by insect pests than those grown on wet land. Draining also enables the land to be work by teams almost directly after heavy rain; this is a great benefit to settlers in the Southern and South-Western districts especially. There are plenty of gardens and orchards on which it has not been possible to take a horse without getting bogged since last June, and it may be several weeks yet before such land can be worked. This means a serious loss to the owners, and a system of draining this land is well worth considering as a means of increasing the profits to be obtained from a farm. Early tomatoes from the Northern districts are now coming into the market, and anyone looking out for a profitable investment for their spare cash might well turn their attention to the raising of tomato plants somewhere to the north of Geraldton and supplying the Perth and goldfields markets. Tomatoes raised in these districts, being very early, are always sure to obtain the best prices, and being a vegetable that is always saleable at a good price, should bring in handsome returns to the grower. Not much can be done in the way of planting out in the garden during this month; but the ground should be kept well stirred, and all weeds cut down as soon as they appear.

BEANS (French or Kidney) should now be plentiful in all parts. The pods should be picked before they get too old, as the more they are picked the better they bear; but when they begin to mature their seeds they soon stop bearing. A few more rows should be sown to keep up a succession.

BEANS (Lima).—Those sown early should now be making good growth and the climbing varieties ready for staking. A further area may be planted.

BEET (Silver).—The plants should now be giving a good supply of green leaves; the outer leaves only should be cut off as they mature. A further supply of seed may be sown.

CABBAGE.—In moist situations a few plants may be put out, but they will probably require shading for a few days after transplanting.

CELERY.—The plants will require hilling up as they grow to cause them to bleach. A few rows may be sown to keep up a supply.

CHOKOS.—The fruits of this plant may be planted whole as soon as they begin to shoot. The plants climb well and are prolific bearers and the fruit a novelty, something like a squash in appearance.

CUCUMBERS.—Fruit from the early-sown plants should now be plentiful. In moist localities a little more seed may be sown. Cat worms are likely to prove troublesome on the young plants, and a sharp lookout should be kept for them; they are generally found in the ground close to the stem of the plants. A little Paris green and pollard placed where they can get at it will help to keep them in check, but it should not be placed where poultry or any stock can get at it, otherwise the remedy will prove worse than the disease.

EGG PLANTS.—Young plants for the seed bed can be planted out, but will probably require shading. A few more seeds can be sown.

MAIZE (Sweet) may still be sown, but leave room to cultivate between the rows. This plant makes a wholesome and nourishing vegetable, and is well worth considerable more attention for table purposes than it receives. The cobs should be pulled when the grains are full of milk and before they become hard.

MELONS.—Early rock melons should now be fairly plentiful. The water melons for the early districts should also be in the market. Keep the ground well stirred between the rows until the vines cover the ground.

PUMPKINS AND SQUASHES require the same treatment as melons.

SWEET POTATOES.—The young shoots from the tubers planted in the seed beds should all be planted out in the field by this time, but if more shoots are available they will require shading and possibly a little water when being put out. Keep the ground between the rows well cultivated until the vines cover the ground.

TOMATOES are now coming forward from the early districts, but from Perth southwards the plants are not so far advanced. Manure liberally to insure a good growth, and tie up to stakes as the plants grow, so as to keep the fruit off the ground. By carefully shading when transplanting a further supply of plants can be put out.

FARM.—According to locality, the hay and grain harvest will be in full swing, and the days all too short for the quantity of work the energetic settler wishes to crowd into them. Certain varieties of wheat shed their grain very quickly, and what appears to be hardly fit to cut one day will, if the weather is hot, lose a considerable percentage of grain the next. Such varieties as these must be harvested very quickly, or the yield will be very much reduced. To do this the harvesting machinery should be kept going as many hours per day as possible; in fact, many large farms work two shifts of men and horses and their binders and strippers per day, one team starting at 4 a.m., and working until mid-day, and the other team starting at mid-day, and continuing until about 8 p.m. Owing to the wet weather, and the ground getting wet and cold, the yield this season does not promise to be as heavy as last, but the increased area sown in wheat should keep up the total yield to about the same as last season. Indications at the present time point to a greater proportion of the crop being left for grain than previously, consequently there is likely to be less chaff available, but as there are still good stocks of hay and chaff in the country, this will be of benefit to those who hold supplies. A great deal of loss has occurred this season through the waste in hay stacks caused by the wet penetrating into the hay, and to prevent this all stacks should be thatched before the wet weather sets in. Also as soon as a stack is built a few plough furrows should be run round it to act as a fire break, and if fire breaks have not been ploughed round the grass paddocks this should be done at once, as bush fires are likely to occur at any time.

In parts where sufficient moisture remains in the ground to germinate the seeds, a little sorghum, cow-peas, or French millet may be sown; but the most important work after harvesting is to keep the ground well stirred among the summer crops, so as to conserve all the moisture possible.

THE CLIMATE OF WESTERN AUSTRALIA DURING OCTOBER, 1904.

The month has been unusually cold and wet for the time of year throughout the Southern half of the State. Pressure was about normal, but nearly every station in the State registers mean temperatures below the average for previous years, the defect being greatest in the interior, the mean daily maximum being about 5° below the normal throughout the Coolgardie Goldfields.

The principal meteorological features of the month were two disturbances presenting quite different features, one affecting the weather during the first two days, and the other in the middle of the month. The former travelled overland from the North-West coast (or about Sharks Bay) to the Bight, and was accompanied by thunderstorms throughout the Goldfields. The latter was a very severe storm of the usual winter type, passing South of the Leeuwin, where the barometer fell to 29·055 on the 17th, and producing severe gales and tremendous seas along the South-West and South coast, with heavy rain extending throughout the Southern portions of the State, and in a lesser degree over the Goldfields. The greatest wind velocity recorded was 65 miles per hour at the Leeuwin, and an average of 54 miles per hour throughout the 24 hours ending 9 a.m. on the 18th.

On the whole, the rainfall was considerably in excess of the mean for previous years throughout the State South of latitude 29° (Geraldton), but very little fell North of that parallel. Frosty weather was experienced inland in Southern districts occasionally, but the season for frosts is now over. The following table shows the mean and absolute minimum temperatures on the surface of the ground at a few places:—

Station.	Mean.	Lowest.	Date.
Peak Hill ...	51·1	40·2	10
Cue	49·0	40·0	9
Coolgardie...	43·4	35·7	9
Southern Cross	45·6	36·0	9
Walebing ...	41·5	33·0	27, 29
York	44·5	33·0	9
Perth Observatory	48·5	39·5	9
Wandering	...	...	...
Narrogin ...	41·7	34·0	4, 9
Katanning	41·0	32·0	10
Bridgetown	39·5	29·0	9
Karridale ...	43·2	28·2	9

The Climate of Western Australia during October, 1904.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						October, 1904.					* Average for previous Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	29·872	29·905	30·069	29·691	96·6	78·7	87·6	103·0	68·4	98·4	79·1	110·2	71·2	77	2994
	Derby	29·899	29·920	30·055	29·724	95·7	69·2	82·4	103·0	58·8	96·8	71·1	109·2	58·6	12	3194
	Broome ...	29·920	29·926	30·057	29·771	89·0	70·7	79·8	98·8	62·0	91·0	70·1	108·6	52·8	26	2382
	Condon ...	29·932	29·948	30·089	29·778	86·6	61·3	74·0	99·0	54·0	91·5	61·4	108·2	49·0	6	649
	Cossack ...	29·926	29·960	30·056	29·727	90·1	64·1	77·1	100·0	60·0	92·8	65·4	110·5	56·0	*Nil*	1323
	Onslow ...	29·945	29·973	30·095	29·794	87·6	58·6	73·1	98·0	51·0	88·9	60·1	108·5	51·8	1	1528
	Carnarvon ...	29·986	30·030	30·187	29·793	78·6	58·5	68·6	96·4	50·9	77·9	60·7	100·6	52·1	2	1094
	Hamelin Pool...	29·980	30·022	30·190	29·730	82·0	54·0	68·0	95·0	47·0	81·5	55·0	101·6	44·6	3	1059
	Geraldton ...	30·048	30·062	30·262	29·607	73·8	52·0	62·9	90·0	44·5	72·8	55·4	100·0	43·0	90	1467
Inland:	Hall's Creek ...	29·934	29·928	30·127	29·744	94·3	63·5	78·9	100·0	54·8	98·3	67·9	108·0	48·4	23	2834
	Marble Bar* ...	...	...	...	...	94·4	62·9	78·6	103·2	54·0	98·6	65·8	107·5	51·2	*Nil*	1109
	Nullagine ...	29·908	29·928	30·127	29·656	91·3	58·9	75·1	100·0	48·0	95·1	60·8	107·0	43·9	*Nil*	832
	Peak Hill ...	29·960	29·960	30·190	29·598	80·0	56·0	68·0	94·0	44·0	85·1	59·0	97·6	41·3	15	933
	Wiluna ...	29·916	29·960	30·238	29·496	80·0	54·0	67·0	95·5	42·5	84·0	55·1	98·2	39·1	8	1005
	Cue	29·984	29·996	30·234	29·596	78·3	52·8	65·6	96·0	41·3	82·9	55·0	99·0	41·5	18	1266
	Yalgoo ...	29·981	30·004	30·243	29·606	77·4	52·2	64·8	90·7	46·2	80·9	52·6	98·6	38·9	33	842
	Lawlers ...	29·965	29·974	30·302	29·459	77·5	52·2	64·8	95·1	42·2	82·7	55·7	99·9	41·2	12	1011
	Laverton * ...	29·960	29·998	30·350	29·392	76·4	52·5	64·4	95·5	42·0	81·7	53·4	102·3	39·0	80	1034
	Menzies ...	29·963	29·981	30·367	29·364	75·4	50·9	63·2	93·9	39·0	79·7	53·6	99·0	39·7	85	913
	Kanowna ...	...	...	...	...	73·0	48·9	61·0	93·5	39·5	...	...	...	...	180	999
	Kalgoorlie ...	29·962	29·985	30·392	29·275	73·0	49·7	61·4	94·0	39·4	78·3	53·0	97·6	40·5	139	1034
	Coolgardie ...	29·970	29·988	30·368	29·275	71·6	51·4	61·5	93·9	38·4	78·2	51·2	99·8	39·5	187	1046
	Southern Cross	29·970	29·982	30·374	29·435	74·0	47·2	60·6	89·8	38·8	77·8	49·1	107·0	35·0	187	1598
	Walebing ...	...	...	...	...	68·9	46·3	57·6	82·8	36·2	...	...	...	...	214	2091
	Northam ...	...	...	...	...	72·3	46·8	59·6	81·0	38·0	...	...	...	...	149	2241
	York	30·016	30·025	30·373	29·372	70·4	46·8	58·6	82·3	37·0	73·2	46·8	91·5	31·4	188	2112
	Guildford* ...	...	...	...	...	70·2	51·0	60·6	83·4	44·2	72·6	50·2	93·0	40·6	399	2323

* Averages for three years only.

The Climate of Western Australia during October, 1904—*continued.*

Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. October, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:															
Perth Gardens ...	30·026	30·060	30·362	29·369	70·7	54·8	62·7	85·8	46·4	71·5	52·3	96·0	41·0	394	3376
Perth Observatory	30·031	30·044	30·369	29·368	68·0	52·2	60·1	83·7	42·3	69·0	53·3	89·8	41·2	403	3341
Fremantle ...	30·034	30·030	30·359	29·356	66·8	54·6	60·7	77·2	45·0	67·6	56·0	87·0	41·6	232	2975
Rottnest ...	30·031	30·017	30·351	29·342	66·8	55·6	61·2	83·6	47·0	67·5	56·4	85·2	43·5	184	2505
Mandurah ...	...	...	...	...	66·8	50·5	58·6	81·0	43·0	69·5	49·0	89·3	36·3	271	3492
Wandering ...	...	...	...	...	65·6	47·7	56·6	81·0	37·2	...	...	...	...	305	2947
Narrogin ...	...	...	...	...	64·0	45·7	54·8	73·5	39·0	...	...	...	...	257	2352
Collie	...	...	...	...	66·3	44·3	55·3	82·0	35·3	68·2	43·8	87·0	31·2	312	3227
Donnybrook ...	...	...	...	...	65·8	46·2	56·0	80·0	36·5	...	...	...	...	323	3280
Bunbury ...	30·026	30·065	30·400	29·271	66·3	50·6	58·4	77·2	41·0	68·3	50·9	89·2	37·4	250	3265
Busselton ...	...	...	...	...	66·3	47·0	56·6	75·0	38·0	67·9	47·6	85·8	37·2	256	2798
Cape Naturaliste	30·007	...	30·405	29·220	62·6	51·2	56·9	69·0	42·8	...	...	...	...	274	2774
Bridgetown ...	...	...	...	...	66·0	42·8	54·4	76·0	32·5	68·3	43·5	86·0	31·2	363	2856
Karridale ...	29·982	30·026	30·376	29·244	66·3	49·5	57·9	80·2	41·2	65·7	50·3	85·2	36·8	447	3984
Cape Leeuwin ...	29·972	29·982	30·382	29·055	64·1	53·9	59·0	72·2	48·2	64·3	54·9	82·8	44·8	315	3274
Katanning ...	29·982	30·000	30·486	29·249	65·6	44·9	55·2	78·0	37·0	68·6	45·8	87·0	31·0	296	1916
Albany	29·959	29·990	30·381	29·163	65·5	47·9	56·7	77·8	42·5	65·3	49·4	83·0	36·2	567	4114
Breaksea... ...	29·944	29·981	30·384	29·131	61·1	51·0	56·0	74·2	43·8	61·8	52·0	78·0	39·0	434	3167
Esperance ...	29·942	29·997	30·446	29·401	68·2	50·5	59·4	87·5	41·5	69·5	51·2	101·4	36·2	465	2999
Balladonia ...	29·978	...	30·452	29·562	72·3	48·5	60·4	94·3	41·0	...	...	...	...	136	979
Eyre*	29·930	30·021	30·350	29·339	69·5	51·8	60·6	89·8	40·0	72·4	51·0	99·5	30·0	169	1291
INTER-STATE.															
Perth	30·031	30·044	30·369	29·368	68·0	52·2	60·1	83·7	42·3	69·0	53·3	89·8	41·2	403	3341
Adelaide	29·985	30·021	30·388	29·270	73·4	52·7	63·0	95·7	43·6	72·7	51·4	100·5	36·0	211	2137
Melbourne	29·976	29·883	30·460	29·377	68·1	48·9	58·5	88·7	38·2	67·0	48·1	...	...	272	2851
Sydney	30·050	29·998	30·420	29·740	71·0	56·0	63·5	86·0	44·0	71·1	55·9	99·7	43·3	233	4459
Cocos Island ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Averages for three years only.

The Observatory, Perth, November, 1904.

W. E. COOKE, Government Astronomer.

RAINFALL for September, 1904 (completed as far as possible), and for October, 1904 (principally from Telegraphic Reports).

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
East Kimberley:				
Wyndham ...	Nil	...	77	4
6-Mile	...	...	...	...
Carlton	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	30	1	...	...
Lisadell	...	...	...	...
Turkey Creek ...	3	1	93	3
Hall's Creek ...	20	1	23	3
Nicholson Plains	...	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	...	...	...	...
Beagle Bay ...	Nil	...	...	...
Derby	Nil	..	12	1
Yeeda	...	...	...	...
Liveringa ...	Nil	...	..	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	2	2	47	5
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	3	1	26	1
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	8	1	Nil	...

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
North-West:				
Wallal	3	1	Nil	...
Condon	22	1	6	1
Pardoo	31	1	...	...
DeGrey River ...	13	1	...	...
Port Hedland ...	23	1	3	1
Boodarie ...	...	...	53	1
Warralong ...	11	1	169	1
Muccan	40	1	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	32	1	...	...
Station Peak ...	34	2	...	...
Coongon	...	...	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	23	1	Nil	...
Marble Bar ...	7	2	Nil	...
Warrawoona ...	22	1	Nil	...
Corunna Downs...	12	1	...	...
Nullagine ...	Nil	...	Nil	...
Mt. Edgar ...	...	..	...	...
Kerdiadary ...	19	2	...	...
Roy Hill... ...	...	...	...	...
Middle Creek ...	5	1	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	48	2	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	80	2	...	...
Tambrey ...	100	2	...	...
Millstream ...	90	2	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	91	2	Nil	...
Cooyapooya ...	100	1	...	...
Woodbrooke ...	...	...	...	...

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
North-West—*cont.*				
Croydon	71	...	...	...
Balla Balla ...	...	...	...	...
Roebourne ...	145	2	Nil	...
Cossack	185	2	Nil	.
Fortescue ...	96	2	Nil	..
Mardie	96	2	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	65	2	...	...
Onslow	21	2	1	1
Peedamullah ...	76	3	...	...
Red Hill	146	2	...	...
Mt. Mortimer ...	57	3	...	...
Peake Station ...	46	1	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	17	2	...	...
Yanrey	47	3	...	...
Point Cloates ...	...	...	...	...
Gascoyne:				
Winning Pool ...	149	3	Nil	...
Coordalia ...	...	...	...	...
Towara	62	3	...	...
Ullawarra ...	27	2	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	97	3	...	...
Bangemall ...	83	2	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	179	2	...	...
Yanyeareddy ...	171	2	...	...
Williambury ...	189	3	...	...
Booloogooroo ...	...	...	...	...
Wandagee ...	...	...	...	...
Minilya	...	...	...	...
Bernier Island ...	...	...	...	...
Boolathana ...	74	6	...	...
Carnarvon ...	77	4	2	2
Brick House ...	...	...	...	...
Doorawarra ...	90	5	...	...
Bintholya ...	125	2	...	...
Mungarra ...	113	3	...	...
Clifton Downs ...	...	..	...	...
Dairy Creek ...	130	6	...	...
Upper Clifton Downs	177	5	...	...

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
Gascoyne—*contd.*				
Dirk Hartog Island	120	11	..	...
Sharks Bay ...	99	6	Nil	...
Kararang ...	176	4	...	...
Meedo	75	5	...	...
Tamala	132	8	...	...
Wooramel ...	62	5	13	1
Hamelin Pool ...	180	6	3	2
Byro	88	4	...	...
Yarra Yarra ...	130	4	...	...
Berringarra ...	219	5	9	1
Mt. Gould ...	235	6	Nil	...
Moorarie ...	224	6	...	...
Wandary... ...	...	..	...	...
Peak Hill ...	161	5	15	2
Horseshoe ...	144	6	8	2
Mt. Fraser ...	125	7	...	...
Abbotts	226	5	Nil	...
Belele	396	8	...	...
Mileura	193	5	15	1
Milly Milly ...	...	...	...	...
Manfred ...	129	7	...	...
New Forest ...	100	6	...	...
Woogorong ...	64	3	...	...
Boolardy ...	171	6	...	...
Twin Peaks ...	...	...	...	...
Billabalong ...	102	8	...	...
Wooleane ...	77	8	Nil	...
Murgoo	97	7	6	1
Yallalonga ...	...	...	...	...
Meka	106	6	10	1
Mt. Wittenoom ...	96	7	11	1
Nannine	392	8	35	1
Star of the East...	374	7	26	1
Annean	317	7	Nil	...
Coodardy ...	354	9	...	...
Cue	366	9	18	2
Day Dawn ...	346	9	8	1
Lake Austin ...	501	9	18	1
Lennonville ...	381	9	19	2
Mt. Magnet ...	325	10	60	3
Challa	282	11	37	2
Youeragabbie ...	342	6	...	...
Murrum	187	6	...	...
Burnerbinmah ...	280	11	...	...
Barnong... ...	185	9	...	...
Mellenbye ...	243	10	78	6

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
GASCOYNE—*contd.*				
Yalgoo	254	9	33	2
Wagga Wagga ...	251	9	19	1
Gabyon	232	8	...	...
Gullewa	218	10	80	4
Muralgarra ...	267	9	13	2
Wydgee	358	8	...	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	183	12	...	...
Mt. View ...	167	7	...	...
Mumby	241	9	135	10
Yuin	163	6	...	...
Northampton ...	231	9	149	6
Oakabella ...	158	7	...	...
Narra Tarra ...	...	...	...	...
Tibradden ...	...	...	...	...
Myaree	213	10	170	11
Sand Springs ...	...	...	209	5
Mullewa... ...	226	10	101	9
Kockatea ...	222	12	99	6
Bootenal ...	...	...	...	...
Geraldton ...	154	15	90	9
Greenough ...	148	9	114	8
Bokara	232	12	140	13
Dongara ...	119	6	52	5
Dongara (Pearse)	119	6	...	...
Strawberry ...	207	10	182	8
Nangetty ...	...	...	...	...
Mingenew ...	138	12	158	9
Urella	134	5	72	3
Yandenooka ...	208	8	175	6
Rothesay ...	451	8	...	...
Field's Find ...	319	10	...	...
Carnamah ...	239	13	107	9
Watheroo ...	196	8	186	9
Dandaragan ...	199	13	290	12
Moora	194	12	317	12
Yatheroo ...	188	8	319	11
Walebing ...	219	13	214	13
Round Hill ...	169	8	161	11
New Norcia ...	151	8	172	7

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	221	14	396	14
Belvoir	187	11	443	11
Mundaring ...	239	14	...	...
Wandu	199	14	425	17
Guildford ...	169	12	399	13
Kalbyamba ...	220	15	326	11
Canning W't'r'w'ks	244	12	473	10
Perth Gardens ...	253	16	394	13
Perth Observatory	260	15	403	13
Subiaco	278	15	388	14
Fremantle ...	263	16	222	14
Rottnest... ...	189	14	184	10
Armadale ...	...	...	...	...
Rockingham ...	334	11	338	11
Jarrahdale ...	485	16	802	10
Mandurah ...	280	13	271	12
Pinjarra	188	8	240	8
Yarloop	252	14	416	14
Harvey	225	12	368	14
Upper Murray ...	268	12	497	11
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	182	9	131	9
Dowerin ...	186	7	115	9
Momberkine ...	213	9	...	...
Monglin ...	275	7	215	8
Newcastle ...	195	8	244	7
Eumalga ...	197	11	251	11
Northam ...	223	10	149	8
Grass Valley ...	252	7	142	7
Meckering ...	180	8	130	9
Cunderdin ...	291	8	176	9
Codg-Codgin ...	331	9	193	11
Yarragin ...	306	9	...	...
Doongin... ...	307	6	116	8
Cuttening ...	326	9	191	9
Whitehaven ...	592	8	...	...
Sunset Hills ...	201	9	214	10
Cobham	257	13	199	13

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
South-West, Central—*contd.*				
Yenelin	296	10	214	12
Mt. Caroline ...	466	5	158	5
York	254	13	188	8
Dalbridge ...	203	9	199	7
Beverley ...	235	7	144	7
Bally Bally ...	291	12	196	15
Barrington ...	209	10	189	11
Stock Hill ...	296	7	164	6
Sunning Hill ...	278	11	230	15
Brookton ...	248	10	184	11
Wandering ...	291	10	305	11
Glen Ern ...	378	11	...	...
Pingelly ...	261	9	178	6
Marradong ...	256	11	329	12
Bannister ...	259	11	...	...
Wonnaminta ...	223	12	...	...
Narrogin ...	303	14	251	15
Narrogin State Farm	312	14	257	14
Wickepin ...	348	9	...	...
Gillimaning ...	289	11	193	11
Bunking ...	299	8	...	...
Bullock Hills ...	254	9	...	...
South-West Division (Southern Part):				
Bunbury ...	191	11	250	14
Collie	259	12	312	14
Glen Mervyn ...	232	11	261	12
Donnybrook ...	230	15	323	14
Boyanup ...	167	14	355	14
Ferndale ...	233	15	359	15
Busselton ...	145	13	256	17
Quindalup ...	226	18	302	17
Cape Naturaliste	193	19	274	18
Lower Blackwood	262	18	408	17
Karridale ...	341	19	447	18
Cape Leeuwin ...	230	23	315	20
Biddellia ...	313	12	...	...
The Warren ...	459	18	684	18
Lake Muir ...	280	11	...	...
The Peninsula ...	195	22	308	19

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
South-West—*continued.*				
Mordalup ...	276	15	...	...
Deeside	256	16	420	15
Riverside ...	250	14	416	16
Balbarup ...	279	27	518	16
Wilgarup ...	252	20	393	16
Bridgetown ...	267	16	363	14
Westbourne ...	182	15	...	...
Hillton	163	7	333	10
Greenbushes ...	314	11	292	11
Greenfields ...	234	11	283	16
Glenorchy ...	218	8	305	11
Williams ...	274	15	163	9
Arthur	237	12	184	7
Darkan	178	6	...	...
Wagin	229	10	265	13
Glencove ...	205	15	344	15
Dyliabing ...	203	10	330	13
Katanning ...	277	14	296	14
Kojonup ...	275	20	399	15
Broomehill ...	245	15	238	12
Sunnyside ...	275	20	279	16
Talbot House ...	223	13	235	11
Woodyarrup ...	260	15	246	12
Mianelup ...	269	14	235	12
Cranbrook ...	...	...	...	...
Toolbrunup ...	204	14	255	16
Tambellup ...	209	18	330	15
Blackwattle ...	239	11	...	...
Woogenellup ...	241	15	379	13
Mt. Barker ...	341	16	487	18
Kendenup ...	320	15	430	16
St. Werburgh's...	207	14	...	...
Forest Hill ...	319	16	514	18
Denmark ...	...	...	513	11
Grasmere ...	391	21	587	18
Albany	375	22	567	18
King River ...	351	8	584	14
Point King ...	391	19	615	17
Breaksea ...	326	23	434	19
Cape Riche ...	235	5	...	...
Cherilallup ...	...	...	...	...
Pallinup ...	241	15	254	9
Bremer Bay ...	294	13	422	14
Peppermint Grove	384	18	426	17
Jarramongup ...	...	...	...	...

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
Eastern Division:				
Dural	188	7	...	...
Wiluna	280	6	8	2
Gum Creek ...	325	8	...	...
Mt. Sir Samuel ...	284	7	34	2
Lawlers	327	13	12	5
Leinster G.M. ...	353	8	...	...
Darda	380	7	...	...
Lake Darlôt ...	...	...	...	...
Mt. Leonora ...	328	11	38	3
Mt. Malcolm ...	257	10	55	4
Mt. Morgans ...	422	10	57	4
Burtville ...	186	7	...	...
Laverton ...	265	9	80	4
Murrin Murrin ...	383	9	58	2
Yundamindera ..	334	10	50	3
Tampa	266	7	32	2
Kookynie ...	297	11	65	5
Niagara	247	9	45	5
Yerilla	324	11	186	7
Edjudina ...	449	8	172	7
Menzies	283	14	85	6
Mulline	290	10	67	6
Waverley ...	267	14	159	5
Goongarrie ...	335	10	201	5
Mulwarrie ...	255	10	155	6
Bardoc	269	8	144	5
Broad Arrow ...	318	11	208	9
Kurnalpi ...	377	11	21	5
Bulong	351	8	180	5
Kanowna ...	332	10	180	5
Kalgoorlie ...	329	13	139	8
Coolgardie ...	205	15	187	10
Burbanks ...	250	11	172	7
Woolubar ...	257	11	257	7
Widgiemooltha ...	245	10	182	7
50-Mile Tank ...	190	7	176	6
Waterdale ...	287	13	198	7
Norseman ...	169	7	203	9
Lake View ...	213	11	183	9
Bulla Bulling ...	230	12	148	9
Boondi	261	12	131	8
Boorabbin ...	211	10	140	8
Eastern—*contd.*				
Koorarawalyee ...	293	7	164	8
Karalee	239	7	225	5
Yellowdine ...	268	7	193	6
Southern Cross ...	418	10	187	9
Parker's Range ...	318	13	236	14
Parker's Road ...	303	6	128	4
Mt. Jackson ...	174	10	85	4
Bodallin ...	354	7	...	...
Burracoppin ...	243	6	198	8
Kellerberrin ...	289	6	238	10
Merriden ...	337	5	237	7
Nangeenan ...	397	7	185	3
Mangowine ...	423	7	...	...
Wattoning ...	438	4	...	...
Noongarin ...	438	6	183	6
Eucla Division:				
Ravensthorpe ...	376	12	245	13
Coconarup ...	440	12	257	10
Hopetoun ...	414	11	453	10
Fanny's Cove ...	330	9	...	...
Park Farm ...	287	12	457	15
Esperance ...	352	11	465	13
Gibson's Soak ...	253	12	452	12
30-Mile Condenser	217	12	369	12
Swan Lagoon ...	202	10	289	11
Grass Patch ...	...	...	...	...
Myrup	314	14	418	15
Lynburn ...	239	7	...	...
Boyatup	234	11	...	...
Middle Island ...	204	14	..	...
Point Malcolm ...	242	12	...	...
Israelite Bay ...	213	10	210	16
Balbinia	201	12	...	...
Frazer Range ...	252	4	...	...
Balladonia ...	180	6	136	9
Southern Hills ...	228	2	...	...
Eyre	73	6	169	9
Mundrabillia ...	...	...	...	...
Eucla	73	5	291	12

The Observatory, Perth,
9th November, 1904.

W. E. COOKE,
Government Astronomer.

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JOURNAL

OF THE

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OF

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NOTES.

OUR SUBSCRIBERS.—Our next issue commences a new year; those desiring the *Journal* to be continued must send in their annual subscriptions at once, as no copies after the present one will be sent out until the amount is received.

STUD BULLS.—The following Government stud bulls are open for re-engagement:—Jersey bull "Fowler Lad"; Jersey bull "Fowler Boy," and Aryshire bull "Peverill." There are also several fine young bulls for sale, particulars of which may be obtained from the Director of Agriculture.

NARROGIN-WILLIAMS AGRICULTURAL SOCIETY.—The annual general meeting of the Narrogin-Williams Agricultural Society was held on Wednesday, 23rd November, and was attended by a large number of members. The secretary's report proved that since last April the membership had been increased by 176, making a total of 223. The actual profit made over the two days show was £223 6s. The committee intend sparing no trouble or expense in eclipsing all other country shows next year. The secretary's salary was raised £50, in addition to which he was awarded a bonus of £50, and was made a life member of the society.

A PROMISING POTATO.—From the Cherrydale orchard, near Donnybrook, we hear from Mr. G. F. Swiney a good account of his experience with a potato not much known to our growers, viz., the

"British Queen." "I planted 26lbs. of seed in January last," says Mr. Swiney, "and dug 6cwt. of the finest potatoes I have seen, these I bagged and stored until September, and on turning them out to sow I did not get one bad one, all being as firm as when dug. I sowed half an acre, and now, less than twelve months since I sowed the 26lbs., I have from five to six tons to dig. I feel sure this is going to be the potato of the future, being a beautiful cooker and very clean and smooth in the skin, a splendid keeper and heavy cropper. I am selling this seed, as dug, at 10s. a quarter, and believe I shall have no trouble in doing so."

GRASSHOPPER POISON.—In further reference to an application of Mr. Scott's, of Clifton Downs Station, for a grasshopper parasite, Mr. A. Despeissies remarks:—I notice that notable success is obtained in the States of Kansas and of Manitoba by the use of poisoned baits. Bran bait, which is commonly used in orchards, and consists of bran, sugar, saltpetre, and Paris green, in the proportions of 100, 8, 1, and 4 respectively, is very good. It is moistened with water and spread broadcast, or placed in lumps, where the grasshoppers are thickest. Another formula, which is much cheaper and is said to attract the insects for a considerable distance, either when fresh or when several weeks' old, is called in Manitoba the Criddle mixture, from the name of the inventor, and is as follows: Horse dung 40 parts, salt 2 parts, Paris green 1 part. Moisten with water and scatter over the infested places. The mixture presents the advantage of not being picked up by sheep or other farm stock. Should this mixture be used by station-owners troubled with locusts, the benefit of their experience would be of value to this Department as well as to others seeking information on the subject.

SAN JOSE SCALE.—A report from one of the Inspectors under the Insect Pests' Act to the Director of Agriculture contains the following paragraph: "I have examined Mr. Armstrong's orchard at Quindalup, and was unable to find a single specimen of the San José scale on any one of the trees. This is the most successful result from fumigation that I have yet seen. Mr. Armstrong stated that he had carried out the instructions given him to the very letter. The orchard which was previously infested throughout is now perfectly clean." In commenting on this Mr. Despeissis, the Horticulture and Viticulture Expert, remarks: "During the past winter those owners of orchards where the presence of the San José scale had been reported, have been engaged in fumigating their trees by means of hydrocyanic acid gas. Others have supplemented this with spraying with lime, sulphur, and salt wash. When the work has been done with care and methodically, the result has been highly satisfactory, and the instance under notice is a case in point. This should be an object lesson to others who may be troubled this year, and who should make it a point to fumigate their trees during next winter."

DESTRUCTION OF LOCUSTS.—Several years ago it was noticed in the wheat fields of Canada that the local broods of grasshoppers or locusts were in the habit of devouring fresh horse-droppings, to which all in the vicinity seemed to be attracted. Previously, settlers had been in the habit of scattering poisoned bran or pollard round their fields, but noticing this habit, experiments were carried out, substituting the droppings for the more expensive bran or pollard, with very satisfactory results. This is now known as Criddle's Compound, and the latest formula consists of 1lb. of Paris green to 100lb. of droppings, thoroughly mixed with a spade, to which water containing 2lb. of salt is then added, until the whole makes a mash; this is thrown into a cart, taken out to the field, and scattered broadcast over the grass among the "hoppers" with a spade. Hearing from Mr. A. P. Cooper, of Cullingral, Merriwa, that large mobs of small locusts were appearing all over the run, where they bred last year, Mr. Froggatt, New South Wales Government Entomologist, arranged with him to visit the district, and try Criddles Compound among these swarms. Two days were spent spreading the mixture among the swarms that were slowly extending from the breeding-grounds, and the next day numbers were lying dead all round the thistles, and others were in a more or less dying state, hopping about on one side, and hardly any of the droppings were left, though grass was abundant all over the infested ground. "I am quite satisfied," Mr. Froggart says, "with the result, which is far more effective than any trials that we have made with African Locust Fungus, with which you have first to infect the locusts before they can start, and unless the weather is suitable (damp and cool), the spores will not germinate. There are too many unfavourable conditions attached to the use of this fungus to ever give us a hope of it being of any great value in dealing with locusts in a climate like our western scrubs. Criddle's Compound is cheap, can be easily compounded and distributed, and there is no danger to the stock in the paddock where it is used. The better it is mixed the more effective, and I think early morning or evening would be the best time to spread it, as during the heat of the day the locusts cluster together on the ground and grass, like an immense antbed, and are not feeding, the sun drying the mixture before they find it."

MALAGA WINES.

By A. DESPEISSIS.

"Port Wine" has already been touched upon in a previous issue of this *Journal.*

As vintage comes near, I intend following up these notes with some I collected when at Malaga and Xeres, both famed amongst the towns of Andalusia for the production of these noted liqueur wines of Spain.

From Oran to Malaga the distance across the Mediterranean is not considerable, but as I could ill-afford to wait for the regular fortnightly boat, and was anxious to keep on with the grape pickers from the warmer latitudes of Algeria and Andalusia to the cooler Burgundy and Côte d'Or, we ventured out on a slow and smelly craft leaving for Almeria.

From that port travellers have the option of reaching Malaga by a coastal steamer, or of travelling overland by a circuitous route *via* Grenada.

The difficulties which beset the traveller landing at a Spanish port, once experienced, acted as a deterrent in adopting the sea route, so, choosing the latter, and, after breaking the journey at Grenada, we arrived one Sunday afternoon in the middle of September at Malaga. From the high irrigated plain or *Vega* of Grenada, encircled by the snowy ridges of the Sierra Nevada, to the low irrigable land of the fruitful *Hoya* of Malaga, at the base of the last spurs of the surrounding sierras, the contrast is striking. The vegetation and crops of the temperate zone are left behind, and from Bobadilla, the junction of trains for Malaga, Grenada, Gibraltar, Seville, and Cadiz, a distance of 70 odd miles, the train descends some 1,300 feet to plains where cotton, sugar-cane plantations, groves of oranges and pomegranates, and muscatel vineyards meet one in every direction.

From Bobadilla the run down the valley of the Guadalhorce is done at a rapid pace, as the train follows the line laid on the ledge of rocks which forms one of the banks of the torrent. In quick succession one threads a dozen tunnels, and at short intervals one gets a glimpse of the wild scenery of the mountains and ravines around. As the gorges of the coast range are left behind, miniature gardens mark the tortuous course of the water channels laid by the Moors along the contours of the slate hills. Amongst the trees rows of sweet potatoes, maize, capsicums, and other garden crops are disposed in ridges along which the irrigation water is made to flow. As the valley widens and the slopes are less abrupt the

vineyards commence. These hillside vineyards supply much of the grapes which are made into wine.

The bulk of these vines consist of *Pedro Ximenes*, which produce the best Malaga wine, we will later on meet again in the forefront of the sherry grapes at Xeres. Other grapes are also grown amongst these; some, as the *Doradillo*, are familiar to Australian vinegrowers; others, such as the *Mantua de pilas* and the *Tempranillo*, are less known. The first-named grapes, which put one in mind of the "late sherry," found in New South Wales vineyards, seemed extensively cultivated; the second, which is the *Listan*, of the South of France, is a popular grape both for eating and for wine-making. It is very early, yellowish green when ripe, and produces a delicate and pleasant wine.

Some black grapes are also cultivated, which go by the name of *Tinto* (red), and are called *Tintillo* at Xeres and *Mataro* or *Mourvèdre* in the South of France.

Besides these grapes, which grow on the drier land, the *Moscatel* is widely cultivated on the fertile plains around Malaga, where it shares with the sugar-cane the water brought down from the hill-side streams along the irrigation channels. The best of these *Moscatels*, firm, fleshy, with a tough skin, are taken to the *paseras*, where they are sun-dried, and what is left is turned into *Malaga-Muscats*: These do not come up to the fruity *Lunel* and *Frontigran Muscat*, made of the clustered brown Muscat known in Western Australia as the "Constantia."

The ground on which these vineyards are established varies from a ferruginous schist on the mountain slopes to a loose, grey, sandy loam, intermixed with waterworn pebbles on the flat country. The best *Moscatels* are grown on light alluvial loam, reddish in colour, and also mixed with pebbles.

The vines are trained low and pruned short, and when the Muscats are grown to be dried into *pasas*, the bunches hang low over the ground that bowl-shaped holes are scooped out underneath. Observation of generations past has stamped this practice around Malaga. Into these crucible-like hollows the bunches hang, and, as they ripen, assume a rich amber colour, a great firmness of flesh, and a high percentage of grape-sugar.

The amount of cultivation bestowed upon these vines may be pronounced as scanty, from the Australian standpoint, which aims at keeping into the ground as much moisture as possible.

Along the rows, which are six to eight feet apart, two ploughings follow the pruning; then, in the spring, one or two hoeings; and the vine, I am told, is then left to itself until vintage time.

To Messrs. Scholtz Hermanos, one of the oldest and largest firms of wine merchants in Malaga, I owe much of what I was able to see whilst there.

A short drive outside Malaga brought us to their pressing house, standing on grounds walled in. Within these compounds are the pressing house or "lagar," the wine-cellar or "bodega," the cooperage, stables, etc.

From the country around farmers and vignerons come with their loads of grapes. These grapes come on pack mules, donkeys, or in bullock-carts; and, if sound and good, they are bought at so much an *arroba*, which is equivalent to 25lbs.

The price paid for sound fresh wine grapes ranges from 3s. to 7s. per cwt., whilst for partially dried Pedro Ximenes, used for imparting the fruity taste to the Malaga wines, the price varies from 7s. to 15s. per cwt.

The farmers, having delivered the grapes at the *lagar*, these are spread on the treading platform—a raised brick or stone structure, either square or oblong inside, and 20 to 30 feet long on the sides.

That treading platform, which is under cover, is slightly convex in the centre, where a screw-press stands; on the edges is a low wall, a few inches high, through which holes are provided, over small cement tanks built around. The grapes having been spread in a layer over that treading platform, several men, either barefooted or wearing shoes made of *esparto* grass, tread them systematically. The expressed grape-juice runs into the cement tanks around the *lagar*, and the pulp is put into esparto bags similar to those used in olive oil mills; these are stacked under the screw press. The juice that runs out also flows into the cement tanks on the outer walls, whence it is taken up by the pump and transferred into the fermenting house close by.

It is thus seen that the grape juice and the pulp are thoroughly ærated during the process of treading; it is also noticed that the husks are not left to ferment with the juice.

Most wine makers, moreover, purchase as well fresh grape juice from the growers, and it was a novel sight to see that juice carried into town on pack donkeys; for that purpose it is contained in two small kegs, strapped one each side of the beast of burden, each keg having in the bunghole a tin tube shaped like two inverted funnels soldered together. It is to avoid splashings caused by the movements of the animal as well as by any fermentation that may have set in at the time.

KINDS OF WINE MADE.

An hour profitably spent in the *bodega* proved to be an experience of the pleasantest sort, and whilst going through the whole gamut of the wines stored for generations past, I managed to make notes which led to more information being gathered, respecting the *modus operandi* presiding over the manufacture of the wines tasted.

On that occasion samples were drawn from amongst the patriarchs that stood in rows in the cellars. I have a particular recollection of a 1848 "Pedro Ximenes dry," with a pronounced rancio and an onion peel colour. In contrast to this wine I was given a 1850 "Pedro Ximenes sweet," and much lighter in colour—that wine was worth, in bulk, 14s. a bottle; then a 1787 "Malaga Color," a wine 116 years old and unique of its kind. To compare with this I was given to taste a four-year old *Lagrima Moscatel*, a wine of golden colour, of a velvety and unctuous taste, and of a fine aroma; that aroma, however, unlike the rancio, which grows more pronounced with age, disappears after a few years keeping. After this I was given a heavy and spirituous "Tinto," sweet and dark, a wine much in demand in England for sacramental purposes under the name of "Tent." Together with that collection, but not a Malaga wine, I have also recollection of a fine five-year old "Montilla" wine, made of *Doradillo* grapes, on the Duke of Medinaceli's vineyards on the rocky slopes near Cordova, a wine light in colour, crisp, and dry to a degree, and of fine sherry character, which put me in mind of some of our West Australian wines made of Spanish grapes.

That tasting experience was unique, and some of the wines I tasted were priceless and not to be bought in the market; others were worth from £1 to £15 the "arroba" of $3\frac{1}{2}$ gallons, or 1s. to 14s. a bottle.

Of late years fraudulent competition has largely exploited the Malaga market, and pushing German imitators have led the way in manufacturing, with the aid of molasses and fig syrup, cheap and nasty concoctions which unfairly sell as pure Malaga wines. As must have been gathered from the foregoing, Malaga wines are sweet, almost syrupy, wines.

Let us now follow the fresh must pumped from the cement tanks around the *lagar*. It is transferred to large wooden casks, where it ferments. The "Dry Malaga" is a white full-bodied wine, which is allowed to ferment without interference. After a month or two it is fortified by means of the addition of about 5 per cent. of spirit of wine. Those makers who have made a name for their wines use nothing but the best rectified grape spirit procurable. The tendency, however, of late has been to extensively use the cheaper and less wholesome German root spirit. That wine is racked every three months the first year, and at less frequent intervals in subsequent years.

It is the produce of good, sound, ripe grapes. To the dry spirituous wine is incorporated after a time a percentage of specially prepared sweetening known as *Vino Tierno* and of *Vino Maestro*. That admixture is generally made after the first year of keeping. Each maker prepares his own grape syrup, which imparts to the Malaga wine that unctuous aroma called *embocado*, the *bonneboche* of the French. That preparation also helps to make imitation Madeira and Port wine.

The *Vino Tierno* (tender wine) is made by treading into a paste say 100 kilos of sun-dried Pedro Ximenes, to this is incorporated about one-third its weight of water, and the liquid paste is then put into *esparto* bags and pressed until somewhat about one-third of the combined weights of raisins and water, or, approximately, one-half of the weight of the raisins is extracted. After a few days rest, to allow it to clear, the liquid is slightly fortified by means of $1\frac{1}{2}$ per cent. of spirit and is kept until required.

The *Vino Maestro* is, on the whole, more generally employed than is the *Vino Tierno*. Both are used in preparing *White Malagas*.

The *Vino Maestro*, known in other parts of Spain as *Calabres* and *Mistelles*, is prepared by at once bringing up the alcoholic strength of the juice as it runs from the press up to an alcoholic strength of 17 deg. per cent. To effect this one-fifth of grape spirit of 84 deg., by the centesimal scale, is added to the sweet must of over-ripe grapes.

Better known than this Sweet White Malaga is the Sweet Brown Malaga, the *Malaga Color*.

It is the wine more generally exported, and is prepared by means of suitable admixtures to either the Dry or Sweet Pedro Ximenes of one of two grape juice preparations called *arrope* and *color*.

They are both prepared by the wine maker himself.

The *Arrope*, which is a new wine boiled to a syrup, is made by boiling Sweet White Malaga and reducing its volume by evaporation by one-third its original bulk.

For that purpose the wine is first placed into a copper boiler and quickly brought up to boiling point on a brisk fire, when this point is reached, it is allowed to simmer gently until the bulk is reduced by one-third. The operation takes a day to effect.

The *Color* is made from "arrope" by reducing it by means of evaporation over a brisk fire, care being taken not to let it burn. When the volume has been reduced by two-fifths it is removed from over the fire, and one-tenth of boiling water is suddenly added to it and briskly stirred; to this, three-tenths of freshly pressed grape must is added, these admixtures bringing the volume up to the original one.

The *Color* is both more liquid and browner than the *arrope*, which possesses the density of a thin syrup and a peculiar bitterish, but by no means unpleasant, taste. The *color* is even more bitter than the *arrope*, and has a dark saffron colouration. The "Malaga Color" is the result of the addition to Sweet White Malaga of about 8 per cent. of *arrope* or *color*. That amount, however, varies with the type of wine one wishes to make, or with the taste of the particular market that it is intended to cater for.

These wines are put by to mature for some time before they are placed on the market, as it is found that age has a beneficial refining effect which reduces the colour and imparts to the liqueur the requisite delicacy, body, and bouquet.

Malaga Color is susceptible of being kept for any length of time, its price, of course, increasing with age. By blending it is found that a character of old can be imparted to a younger wine in the proportion of the addition of the older wine. Half a 20-year old wine for instance, blended with half a 4-year old wine, gives to the whole the character of a 12-year old wine.

So much for Sweet White Malaga and for *Malaga Color*. Other wines are also made, notably *Moscatels*.

The best of these, known as *Lagrima Muscat*, is a velvety, unctuous wine, fragrant, with the full aroma of the Moscatel. It is made with the pure grape juice as it comes out of the trodden grapes and before the marc is put under the press.

The other, the ordinary *Muscat*, is made of discarded Moscatels unfit for drying, bird-pecked bunches, or berries spoilt as the result of a passing thunderstorm.

I have gone into the making of Malaga wine with some amount of detail, thinking that its manufacture here could be conducted with quite as much success as at Malaga, and the resulting wine would suit the Australian palate, which relishes a sweet and velvety wine such as the Malaga wines.

In a subsequent article I shall say something about Sherries.

STATE EXPERIMENTAL FARM, NARROGIN.

By F. L. FAULKNER.

The few weeks just passed have been very influential in the ripening of all farm crops, and reaping is now fairly general all along the Great Southern Railway. November coming out exceptionally hot after an exceptionally wet cold October has had the effect of ripening off all late sown and late variety crops rather prematurely, and this fact, combined with it being a favourable season for the growth of weeds, has made hay crops on the whole very light and very grassy.

Hay-cutting is very nearly done in most parts, and reports of heavy cuts are few, so that there is little chance of there being such a slump in the hay and chaff market as was predicted at the beginning of the season.

Contrary to the effects of the hot dry weather, one or two instances have come under my notice of the effects of the cold wet weather in October. In this instance it is the very early maturing

varieties of wheat sown early that have suffered, and the result has been a very bad pollenisation of the flowers and a long weakly growth of straw, and consequently a poorly-headed, irregularly-ripened crop, impossible to strip with a stripper or harvester, and hard to pick up with the binder.

A piece of 20 acres of one of our best, although a very early maturing wheat, at the experimental farm this season is a particular instance of a crop affected by the excessive wet and cold weather. The last week in September the crop was about 18 inches high, and promised at least a 16 to 18-bushel crop, but through the fast-growing stage and the flowering coming in a long spell of cold and wet, the result has been very disappointing; and now I doubt if the piece will average 10 bushels of inferior grain.

It must be concluded from this that it is a mistake to sow very early-maturing wheats too early, and likewise it is a decided mistake to sow a late and medium-maturing variety too late. The difficulty may be easily got over, and I think the way to get the best results, taking one season with another, is to sow the latest wheats first and the earliest wheats last, finishing the season, if getting late, with an early wheat sown thickly.

The selection of seed wheats is a matter deserving of much more attention than it usually receives. This season is the one for farmers to keep a look-out for what fresh seed he requires. There is no doubt that the judicious changing of seed is of great importance in grain crops. In a wet district I think it is wise to get seed that has become acclimatised to a rather wetter district; and in dry parts crops from dry parts seem to do the best. Seed taken to a new climate, particularly from a wet to a dry, or the reverse, generally gives the best crop after one or two years acclimatising. The matter of rust-resisting wheats is one that I think all wise farmers should look to. Rust is a parasitical fungus for which there is no cure, and for which a cure is hardly likely to be found, but there are several well-known varieties of wheat that are, for all practical purposes, immune to the effects of it.

The argument in favour of growing these rust-resisting wheats is all the more forcible when it is pointed out that several of them are not only practically rust-proof, but they are big yielders, hardy, stand well for harvesting, and give grain of good milling quality. "Bunt," or smut-proof wheat, is of less importance, as by careful pickling with bluestone (a 1 to 2 per cent. solution) there is little or no danger of smut. It is, however, not a good plan to sow smutty seed.

Another important factor in getting seed, and one that requires to be noted while the crop is standing, is to select the seed only from a strong, well-grown crop.

Seed obtained from a thin-strawed, badly-stooled crop, although much of the grain may be good and plump, is always degenerate.

Cracked and small grains in seed not only tend to make a thin, poor crop, but if taken out and fed to the pigs would easily repay the cost of cleaning well.

HAY-MAKING.

The time to cut hay is a question much debated, and on which there is always much diversity of opinion. It is found by agricultural chemists that a wheat crop gains very little nutriment from the soil a week after it has bloomed, and that after this period the process is mainly one of transference of the nitrogenous starchy matter, etc., from the flag and straw to the grain, and that the straw and flag tend to become woody, fibrous, and indigestible accordingly. The following is a table by Warrington showing the digestibility of hay, cut at different stages, when fed to sheep:—

Date of Cutting.	Amount digested per 100 of each supplied.				
	Total organic matter.	Nitrogenous substances.	Fat.	Soluble Carbo-hydrates.	Fibre.
May 14 ...	75	73	65	75	79
June 9 ...	64	72	51	61	65
June 26 ...	57	55	43	55	61

The above table gives the argument decidedly in favour of the green cutting, and many farmers do cut their hay when in bloom or shortly afterwards. The above experiment, however, having been conducted in England, at Rothamstead, was no doubt carried on with meadow or grass hay, which contained a large proportion of trefoil, clover, etc., which undoubtedly are better when cut at the flowering stage. For purely wheaten hay, however, and particularly for oaten hay, green cutting does not give the results that one would think. In practice, not only does the green cut hay get very light and lose much weight in the drying, but in many cases, and particularly in the case of oaten hay cut green, the hay and chaff is not relished by stock. I have instances on my mind of more than one such case where the horses refused what appeared to be prime oaten chaff, and when forced to subsist on it fell away very quickly, scoured, and showed signs of debility almost as from a kind of slow poisoning.

The most favourable time to cut hay is no doubt when it is at what is know as the "dough stage," *i.e.*, when the grain is well and fully formed, but while it is still soft like dough.

By cutting at this stage it is possible to get the grain in the hay within a few degrees of a good marketable sample, and at the same time hay of a very good colour.

For the market, of course, colour is a great criterion for price, but for home consumption there is little doubt that too much colour should not be sought at the expense of a well-matured corn.

STOOKING.—In the Australian colonies the method of stooking in long rows two sheaves wide is not applicable, as not only would the hay become dried and bleached to straw by the sun, but after the first breeze the whole field would require re-stooking. Hay should be stooked in fairly large stooks immediately behind the binder, and so preventing bleaching and excessive drying, and preserving the aroma and digestible quality of the hay. Put just enough sheaves in a stook to make it a good, tight, conical shape, as large as possible, but not so large as to be flat on the top, or else in the event of a heavy rain they will all require opening out and spreading.

Well-stooked hay will stand a long period of dry weather and a good deal of rain without being damaged materially, the outside bleaching being the only harm done.

For this reason, then, for hay that will have to stand in the field for some time before you are able to cart it, pay good men to do it well, but do not have it done badly at any price.

FEEDING HAY AND CHAFF TO HORSES.

With the advent of the binder in the Australian Colonies the feeding of rack or long hay to horses has become less and less common, till at the present time a very small percentage of the horse-feed consumed is as long hay. This I consider is a matter for regret, as there is no doubt horses fed on long hay at least once a day, preferably for supper, will thrive better and require the services of the veterinary dentist less often than horses fed continuously on short chaff. The reason for horses' teeth that are fed on long hay keeping in a better condition is because the masticating process necessary is natural and thorough. With the feeding of short foods, on the other hand, the process is not of necessity so thorough, being more of a short, grinding motion, resulting in an uneven wearing of the molar teeth. The upper molars naturally generally protrude sideways further than those of the lower jaw, and as this protruding portion ceases to get use it gradually elongates until long enough to reach and irritate the gum on the opposite jawbone. This state of the teeth is invariably the cause of rolling the food and slobbering, now so often found in middle-aged and old horses.

In any case hay fed long, so long as it is not coarse, rank, or weedy, is more economical to feed than short-cut chaff, as the horses bolt less of it and masticate it better.

STRAW AS A FODDER.

This often much-despised but very useful product of the farm can and should be turned to account much more than it usually is. Of course there is always a good deal of coarse, rank straw that is of very little value from a point of view of feeding to stock, but short, soft, flaggy straw, and especially

oaten or malting barley straws, if well prepared and harvested directly after the stripper, are readily eaten by stock during the winter, when what little feed there is is cold, sour, and innutritious.

Straw, if treated with a brine made from salt and molasses while the stack is being built, makes a fodder that I am sure can be very profitably turned to account by feeding to cattle, young stock, and to sheep during the winter. Cavings (cocky chaff) does well treated similarly. By treating the straw with the salt and molasses, while building, a much better stack can be made, although it is a sticky job; and by the time it is used it seems to get softer and more digestible than if mixed just before feeding. This system of preserving the straw is all the more applicable to the conditions of many parts of Western Australia, in the face of the fact that the natural feed has the reputation of being good only for a few months of the year. From what I have seen of Western Australia I conclude that the early winter is the most critical time for the stock, the feed in many parts coming late and being poor and innutritious until the warm weather begins again in September or October; and the need for some stand-by for this period is urgent.

STRAW AS A FERTILISER.

Even when a field of wheat or oats is stripped and the straw not cut the wholesale waste by burning, so often practised, is certainly to be condemned. Of course where the practice of cropping the land year after year with wheat or cereal is carried out, the straw is rather difficult to turn under, and burning is the easiest method of disposing of it. However, the practice of cropping several times successively with wheat is a bad one, as it always results in fouling and mucking up the land; and at the most land should only be cropped every other year. The heaviest crops of straw can usually (after 12 months with stock running in the paddock) be turned under with the ordinary plow, and on land that is suitable, *i.e.*, freed from stumps, stones, etc., any amount of straw can be turned under with the disc plows.

Land that is cropped incessantly, and is each year denuded of every scrap or vegetable matter from its surface, soon loses its humus, and with stiff clays it becomes hard, brick-like, and less productive. With limy soils it becomes dry, pulpy, and chalky; and with sands they lose much of the tenacity, tend to drift, and generally speaking lose what forms their main body and means of retention of moisture and manures.

The humus of soils is, through the agencies of the weather, continually disintegrating and forming soil. Much of it is also consumed by a process of slow combustion, and is lost in the air, so that it is very necessary that as much vegetable matter should be returned to the soil as possible each year; and straw which is already on the land and distributed is well worth a little trouble in turning under and utilising for that purpose. Apart from the physical effect that straw has on soil—although it has comparatively

a very low analysis when put into actual figures, and the value of its ingredients based on prices that would have to be paid if the equivalent were bought as artificial manure—straw is worth from 15s. to 16s. per ton. So that estimating a crop to leave three-quarters of a ton of straw on the land, the manurial value of it is at least 10s. per acre.

An average sample of wheaten straw contains in one ton of 2,240lbs.—

			s.	d.
Of Phosphoric Acid,	6·47 lbs.,	worth approximately...	1	0
Of Potash	25·76 lbs.	„ „ ...	7	1
And of Nitrogen	10·75 lbs.	„ „ ...	7	8
			15	9

It must be concluded from these figures, which are taken from C. M. Aikman's work on manures and manuring, that straw, apart from its beneficial physical influence on the soil, is also of considerable value as a fertiliser.

It must be remembered, however, that it must first become rotted and disintegrated before it can be availed of by the plant as a food.

Oaten and barley straw are both richer in fertilising ingredients than wheaten.

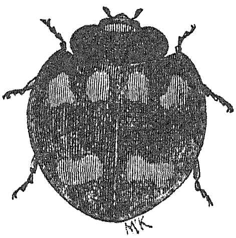
LADYBIRDS AND THEIR LARVÆ.

By T. HOOPER.

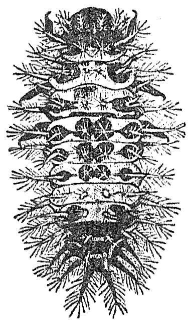
Many people do not know one ladybird from another, and still less know what the larvæ of ladybirds are like. First, I may explain that the larvæ of insects are the young, or that stage immediately following the hatching of the egg, and are called larvæ during the period that they remain in the grub stage. From the grub they turn into a chrysalis or pupa, and from the chrysalis or pupa they emerge as perfect or full-grown insects. There are a great number of varieties of ladybirds, ranging in size from quarter of an inch across to no bigger than a small pin's head. They are also of many colours, some being quite black, some blue, blue and yellow, black and red, and so on. Some varieties prefer feeding on aphides, others on scale insects, as well as on various insects injurious to vegetation, and I have also seen them feeding on the eggs of other ladybirds. A medium-sized ladybird is about three-

sixteenths of an inch across, and the larvæ of the same would be about a quarter of an inch long.

The female ladybird lays eggs of a yellow colour, about the size of clover seed, and about a dozen in a cluster on the leaves and on the stocks and branches of trees. These eggs hatch into larvæ (see illustration, *Orcus Australasiæ* and its larva). In this stage they consume more injurious insects than they do as fully-developed ladybirds.



Orcus Australasiæ, Boisd.

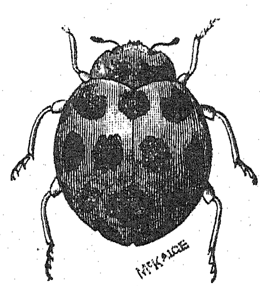


Orcus Australasiæ (larva).

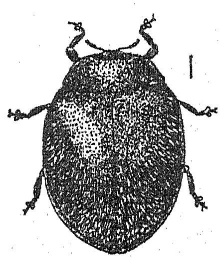
The *Orcus Australasiæ* ladybird is medium-sized; the markings are yellow spots on a black body. It is a native of Australia, and feeds on scale insects.

The *Leis conformis* is a large ladybird about a quarter of an inch across. Mr. Lea, entomologist at Hobart, Tasmania, some few years ago sent strong colonies of this ladybird to this State, and it is now fully established here. It is an aphis feeder, and does a limited amount of good on woolly aphis infested apple trees. Its markings are black spots about the size of pins' heads, on a yellowish brown body.

The *Rhizobius debilis* ladybird is black in colour, rather smaller than the medium size, and feeds on scale insects.



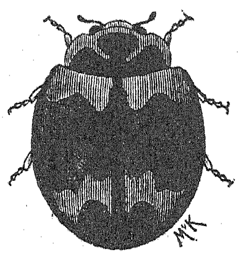
Leis conformi, Boisd.



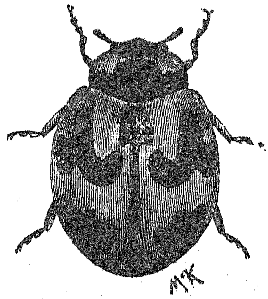
Rhizobius debilis, Blkb.

Symnus vagans is another black ladybird. It feeds on red spider; it is very small, being only as large as a small pin's head.

Chilomenes quadripustulatus is a medium sized ladybird. It feeds on aphides, its markings are four yellow dashes on a black body.



Chilomenes quadripustulatus, Muls.



Coccinella transversalis, Fabr.

The *Cryptolæmus montrouzieri* is a small but very beneficial ladybird introduced into this State by Mr. Compère from New South Wales. It is about an eighth of an inch in diameter. The body is black, the head and tail tip being orange coloured. It feeds on mealy bugs.

Coccinella transversalis is a medium sized ladybird. Feeds on aphides; its markings are black V-shaped marks on a yellow body.

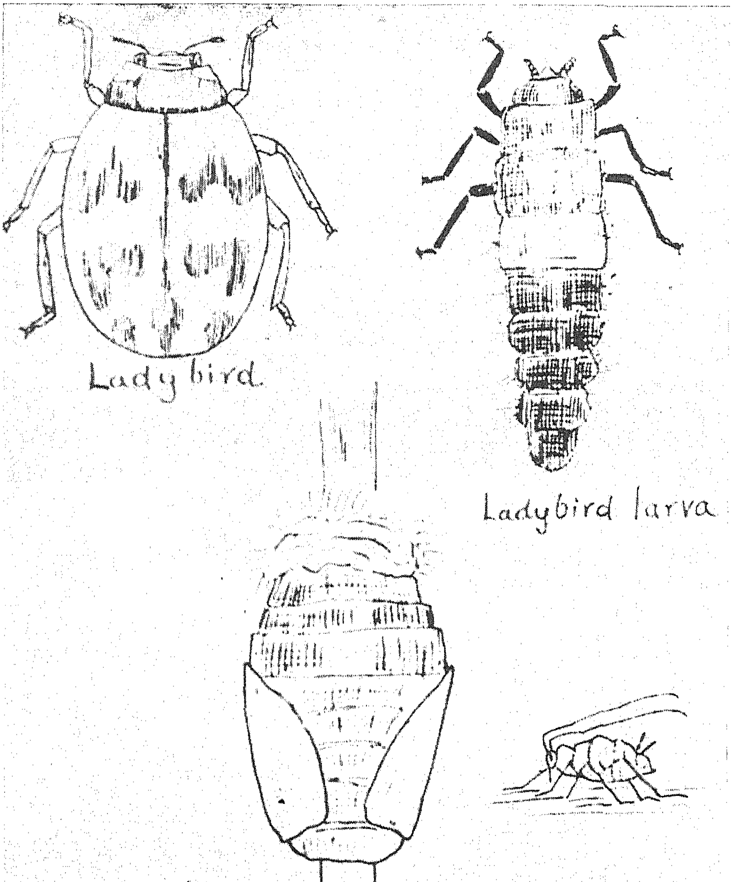
In the accompanying illustration the left-hand top corner shows this beetle or ladybird.

The right-hand top corner shows the larva or young of this ladybird. The larvæ of ladybirds attach themselves to branches and leaves of trees, stakes, or fences, and they shrink up somewhat when they turn into pupa, or chrysalis, as shown in illustration. After a few days the ladybird immerges from the skin, which is left hanging to the wood to which it is attached. When they first immerge the ladybirds are sometimes a little lighter in colour, but rapidly gain their proper hue.

The small insect shown on the right of the pupa is the aphis on which this ladybird feeds.

The *Novius cardinalis* or *Vedalia cardinalis* is another ladybird. In appearance it is somewhat similar to *Coccinella transversalis* only much smaller, being about one-eighth of an inch across, and the colour rather red or orange red with black markings. It is a very valuable insect, as it keeps the cottony cushion scale *Icerya purchasi* completely in subjection.

All the ladybirds mentioned in this article are doing good work in this State.



Ladybird (*Coccinella transversalis*).

THE USE OF EXPLOSIVES FOR REMOVING TIMBER.

By GEO. W. WICKENS.

Discussions frequently take place here in the heavily timbered country about the practicability of using explosives to aid in the work of clearing land of standing timber. Some of the settlers have tried, and failed to do more than shatter pieces from the trunks.

I had occasion recently to visit a young orchard, in the Warren district, about two miles from Balbarrup post office, owned by Mr. J. Johnson, and saw results sufficient to convince the most sceptical of the advantages accruing from the intelligent use of explosives as a means of bringing the trees down.

The holding referred to is situated in one of the densest portions of forest country in this district; trees ranging in size from 18in. to 8ft. in diameter, stand a few yards apart all over the land. Black butt, red gum, and jarrah, are pretty evenly distributed and the worst feature of clearing is the great difficulty experienced in getting the black butt trees to burn after they are down.

A contract for clearing a few acres of this country was let some time ago at £30 per acre to men thoroughly used to the ordinary methods of grubbing and burning, and even at that price the contractors failed to make wages.

Mr. Johnson has had considerable experience in the use of explosives while engaged in mining; and after settling on the land he soon realised that if he had to wait to clear his land in the ordinary way by grubbing, his intended orchard would be a thing of the distant future.

He then purchased a package of gelignite, and commenced experimenting. His first attempts proved failures owing to lack of knowledge of the number of plugs necessary to do the work required. Persevering in his endeavours, however, he succeeded in making a distinct success of the undertaking.

His method of dealing with a standing tree is first to dig and remove the surface soil from around the trunk; he then bores an inch-and-a-half hole in the base, sloping the augur hole downwards towards the roots, and continuing until the augur reaches half-way through the tree. The hole is then charged and fired in the ordinary way, and the tree leaves its resting-place in the earth in a particularly sudden manner.

One tree I saw that had been treated in this way measured 6ft. in diameter, and the charge used for its destruction was 30 plugs of gelignite. The trunk of the tree, always the hardest part to burn when the tree is grubbed, becomes, after the use of explosives, the easiest, on account of the shattering that takes place; the portion with the roots remaining in the ground also fires easily for the same reason.

The cost of gelignite is 1½d. per plug, and the expenditure for explosives averages 1s. 6d. per tree.

As an example of pluck and energy, I think the following undertaking is hard to beat: Mr. Johnson took delivery on 20th July last of 300 fruit trees (enough to plant three acres) and had to clear off green timber, fence, and plough the land before he could plant a single tree. The work was all done single-handed, with the exception of a man and team for three days dragging logs together. The fruit trees were planted and the ground ploughed and fenced by 10th September.

Anyone who has seen the country referred to, will realise the amount of work entailed in getting the trees planted.

A Report on the Flora of the Cowcowing Agricultural Area, recently surveyed for Selection.

By MAX KOCH.

Through the kindness of the Surveyor General, Mr. H. F. Johnston, I accompanied a survey party in charge of Staff Surveyor Mr. M. Fox. This gentleman was commissioned to open up a new agricultural area at Cowcowing, some 35 miles from Goomalling, by surveying and clearing roads, sinking wells, and boring for water.

Being an enthusiastic collector, I gathered specimens of nearly all species of plants I met with, for distribution to my numerous correspondents in the Commonwealth and European countries. The material has accumulated to such an extent that it will take some time to trace the specific names. It will, however, be not amiss to give a description of the general complexion of the flora of a district which, in the near future, will be occupied by the agriculturist, and which will become one of the most prosperous and best wheat-growing centres of this State.

The rainfall, judging by last winter and spring's experience, is copious, and the responsive soil brought forth vegetation in great

profusion; in fact, being but a new arrival from South Australia, I never saw anything like it. It was a revelation and joy to me to view the waving acres of Brome-grass (*Bromus arenarius*), with large patches of everlastings of various tribes and colours spread out like a gorgeous carpet under the shade of the majestic salmon gum.

The soil can easily be classified by the vegetation which is thriving upon it.

Firstly, there are large areas—I should say fifty or sixty thousand acres—of first-class forest land, where the morrell gum (*Eucalyptus longicornis*), the salmon barked gum (*E. salmonophloia*), and the gimlet gum (*E. salubris*) grow to considerable height. Interspersed among the former we meet with the native peach tree (*Santalum acuminatum*), an odd sandalwood tree which has escaped the woodgetter; several species of the native hopbush (*Dodonæa*), with its dark red-winged fruits; desert prides (*Eremophila*), the curious centipede shrub; the terribly prickly and hard dead-finish (*Acacia*); ti-trees (*Melaleuca*); Hakeas with their woody fruits, and Grevilleas with their showy flowers, and others; while many different *Acacias*, with their golden blossoms, lend additional colour and charm to the sylvan scenery, and fill the air with sweet perfume. In these forests the soil is of a deep, rich nature, resting on a clay bottom; and it will be an easy matter to store water in excavated tanks.

Then there are intervening stretches of second-class land, where the soil is lighter and easier to clear and to work. Under careful management, and with judicious artificial manuring, this ground will give fair results in the production of wheat. In these so-called thickets, which require an axe to cut your way through, a wonderful variety of shrubs are to be found: ti-tree, Hakea, *Casuarina* (oak), *Eriostemons* and *Phebaliums*, *Baeckea*, and smaller eucalypts are only the more prominent here enumerated. The best method to clear this land is to roll the shrubs down with a heavy roller.

The sandplains are, of course, not so fertile as the thickets, yet I have seen similar country under wheat in South Australia in the 90-mile desert, near Cookes Plains, which yielded from 10 to 12 bushels of wheat per acre. From a botanical point of view these plains are preferable to forest and thicket; such a great variety of vegetation is growing there that it would take some time to particularise. Principally, of course, the low heath-like shrubs are in evidence, as Baeckea, the beautiful Verticordia in rose-colour or yellow, or white; the Calycothrix, or Star of Bethlehem; many crimson flowering ti-trees; also low-growing Hakea species, and other proteaceous genera are well represented.

As we get near the lakes the saltbush is predominant. *Atriplex vesicarium*, the well-known and highly-esteemed perennial fodder plant, grows here luxuriantly and profusely; *Rhagodias*, *Kochias*, and Bassias, supplemented by several grasses, *Bromus arenarius*,

Diplachne, Danthonia, several *Stipas* and *Aristida*; all these make up an abundant bill of fare for stock of all description.

Before I conclude this crude report, I must emphasise one fact, and that is: In all my peregrinations through the Cowcowing Agricultural Area I have not noticed one solitary plant belonging to the poisonous and much-dreaded genus *Gastrolobium*, though I saw some often enough going down to Goomalling, near Koombekine.

List of Plants noted (orders and genera only).

Dilleniaceæ—	
Hibbertia,	2 species
Ranunculaceæ—	
Ranunculus,	2 ,,
Clematis,	2 ,,
Lauraceæ—	
Cassytha,	1 ,,
Cruciferæ,	9 ,,
Pittosporeæ,	2 ,,
Rutaceæ,	9 ,,
Droseraceæ,	4 ,,
Polygaleæ,	1 ,,
Zygophylleæ,	4 ,,
Geraniaceæ,	3 ,,
Malvaceæ,	3 ,,
Sterkuliaceæ,	2 ,,
Euphorbiaceæ	1 ,,
Casuarineæ,	3 ,,
Urticaceæ,	1 ,,
Sapindaceæ,	4 ,,
Stackhousieæ,	1 ,,
Myrtaceæ—	
Melaleuca,	18 ,,
Eucalyptus,	12 ,,
Baeckea,	5 ,,
Verticordia,	3 ,,
Calycothrix	3 ,,
Other genera,	8 ,,
Rhamnaceæ,	1 ,,
Umbelliferæ,	4 ,,
Santalaceæ,	3 ,,
Loranthaceæ,	1 ,,
Profeaceæ—	
Hakea,	15 ,,
Grevillea,	5 ,,
Persoonia,	2 ,,
Others,	7 ,,
Rubiaceæ,	1 ,,
Compositæ,	41 ,,
Campanulaceæ,	3 ,,
Candolleaceæ,	5 ,,
Goodeniaceæ,	10 ,,
Portulaceæ,	2 ,,
Caryophylleæ,	4 species
Amarantaceæ,	4 ,,
Sasolaceæ,	16 ,,
Atriplex,	2 ,,
Bassia,	4 ,,
Rhagodia,	3 ,,
Kochia,	5 ,,
Didymanthus,	1 ,,
Enchylaena,	1 ,,
Ficoideæ,	3 ,,
Polygonaceæ,	1 ,,
Thymeleæ—	
Pimelea,	6 ,,
Leguminosæ—	
Acacia,	15 ,,
Cassia,	2 ,,
Daviesia,	4 ,,
Other genera,	5 ,,
Crassulaceæ,	2 ,,
Halorageæ,	1 ,,
Plantagineæ,	1 ,,
Primulaceæ,	1 ,,
Apocyneæ,	1 ,,
Solanaceæ,	4 ,,
Labiatæ,	3 ,,
Verbenaceæ,	2 ,,
Myoporineæ—	
Eremophila,	6 ,,
Myoporum,	2 ,,
Asperifoliæ,	2 ,,
Epacrideæ,	2 ,,
Orchideæ,	5 ,,
Haemodoraceæ,	3 ,,
Amaryllideæ,	3 ,,
Liliaceæ,	7 ,,
Fluviales,	2 ,,
Restiaceæ,	2 ,,
Cyperaceæ,	10 ,,
Gramineæ	15 ,,
Filices—	
Cheilanthes tenuifolia	

Total number of species, including introduced plants, is about 330.

CALF REARING.

(*Continued.*)

By R. E. WEIR, M.R.C.V.S.

It must not be understood that after the weaning has been effected no further care of the young animals is necessary; such an opinion will naturally lead to disappointment, and the good results secured in the first instance will be to a great extent destroyed by a falling-off in condition and development. It is, therefore, very essential in the rearing of strong, healthily-constitutioned calves that good pasture should be provided when the young animals are first turned out to grass. This, unfortunately, is not always possible under our local conditions, but as time proceeds, and means of cultivation are facilitated, the coarse nature of the herbage will be supplanted with grasses of a more succulent nature. It will then be possible to secure the best results in this, as in other directions.

A common practice exists amongst many of the farmers to provide a small paddock adjacent to the homestead for the special accommodation of young calves. This is undoubtedly a very essential provision, but care must be exercised that its use for the same purpose is not continued for an indefinite period, otherwise the pasture will become foul, and disease may be generated. To prevent an occurrence of this nature, the soil requires cultivating every fourth year. By this means the ground will be kept in a perfectly sweet condition, and the pasture will also assume a more nourishing growth.

The daily ration of linseed or barley meal must not be dispensed with until such time as the animal is sufficiently vigorous and matured to gain enough nutriment from the grass food alone. Any little trouble or expense incurred in this direction will be more than sufficiently compensated for in the improved development of the animal.

A supply of green food is necessary for late summer use, and no easier or more profitable fodder can be grown for this purpose than maize, which, when green and mixed with a little bran and salt, forms a most palatable food for any class of stock.

No very great success has yet been achieved in the growing of lucerne in this State, but every effort should be made towards its successful production, as once it becomes established it will be of invaluable benefit to the majority of farmers.

In a recent American experiment made in the rearing of calves, a mixed diet of which lucerne formed the basis gave the best results, and has since been recommended as one of the best fodders for use in the rearing of this class of animal.

(*To be continued.*)

LUCERNE-GROWING IN THE SOUTH-WEST.

By A CORRESPONDENT.

The successful growing of lucerne has exercised the minds of many progressive settlers in the South-West division of the State during the past decade; but, unfortunately, with very few exceptions has any good resulted from the many efforts put forth.

On the Preston it has been tried, and, given good opportunity and plenty of manure during the first season it looked well, but gradually disappeared. On the Capel River, on rich flats, for the first two years it looked most promising, but owing to the close proximity in the winter of water to the surface of the ground but few plants now remain. Around Boyanup, where the low-lying and clayey nature of the ground generally would almost prevent one from trying it, one or two spots have been found where it has done very well.

On the Upper Warren is a small patch (at Mr. Peter Wheatley's) which is doing remarkably well, and for its size must keep several head of large stock per acre.

Around the Vasse a few small plots have been tried, but so far the results have not been sufficiently good to encourage one to further extensive efforts, although, with its dark sandy soil and a certain percentage of limestone formation, one might expect it to do well around here.

The very best patch of lucerne, however, that has come under the notice of the writer is to be seen South of Bridgetown, almost on the very top of our highest hills, nearly 1,000 feet above sea level and some 500 feet above the Blackwood River. Force of circumstances no doubt prompted its owner, Mr. Allnutt, to try it there, for that well-known old property "Nelson Grange" is situated, as described, at the head of Quagamirup Brook.

Last year the writer saw the same lucerne field for the first time, in September, and, as is usual with the first cutting of lucerne, there was a fairly large amount of grass amongst it, and it was not possible, under the circumstances, to comment upon it justly without having seen it during the later stages of its growth. From a few questions the history of the field was soon gathered. In 1900 Mr. Allnutt, recognising that green forage was a necessity in the summer, and that the growing of maize on the hills would not be very successful, tried a couple of acres of lucerne, above the orchard, on a patch of land one would not describe as really first-class, being on the fringe of jarrah country, the timber consisting of about half jarrah and half red gum.

The year before the lucerne was planted, half was put in with barley for green stuff and was well manured, and the other half with peas. The latter crop grew very well, but the barley was not at all good. The next year, after the weed-seeds had well started, a light scarifying disturbed the young plants, and woke up any dormant seeds lying in the ground; and in a few weeks, when most of the seeds had become well grown, the land was deeply ploughed and the weeds well covered and the ground harrowed. In the warm days of September and October further scarifying, harrowing, and rolling brought the land into good tilth. Towards the end of October the land was again harrowed, prior to sowing, in the usual way, but in front of the sower a man dragged a light bush over the surface to the width of the cast. This not only reduced the soil to a splendid state of fitness, but was an excellent guide for sowing, the result of which is fully apparent in the evenness of the crop. A final light roller over the seed completed the operation, and Mr. Allnutt stood by to wait results, being satisfied he had done everything well.

Twenty pounds of seed to the acre had been used, and to the eager inquiry, "Well, how did it get on the first year?" came the reply, "Oh, splendidly. It was as clean as a carrot bed, and in about six weeks or two months the mower was run over it, and I was obliged to gather the cuttings off the ground as it seemed too thick to let lie."

A further growth was made the same year, but was not touched. The growth has gradually improved until, at the present time, it stands two feet high and not yet in flower, and thicker than any cereal crop. A large stack of hay from this patch, over from last year, is in the shed, besides feeding numerous cows and horses; and the more it gets cut the better it seems to like it.

Last year the seed and manure drill was dragged over it, and about 3cwt. per acre of guano was sown. The first cutting this year contained a lot of grass, but the lucerne now stands supreme, an object-lesson casting a brilliant ray of hope over the possibilities of the South-West.

Were it not for the heavy cost of clearing, many thousands of acres could be doing equally as well.

There is nothing better to prevent bowel trouble in the little chicks than charcoal. It may be obtained in bulk and after being broken quite fine, may be put in the feed. It is, we believe, one of the ingredients in all the standard chick feeds now becoming so popular.

It costs no more to feed and care for a pure-bred flock than it does for a mongrel lot, and the profits are far greater.

CHERRIES IN WESTERN AUSTRALIA.

By A. DESPEISSIS.

The following report has been submitted by the Horticultural and Viticultural Expert to the Acting Director for Agriculture:—

Cherry-growing has in many localities been a cause of disappointment to a number of our settlers. That fact has in the past so damped the ardour of our fruit growers that no one has gone in for cherry culture in the coastal districts, and others on the cooler and higher districts of our South-West have only done so in a timid, tentative kind of way, and have only planted a score or two of cherry trees. Two or three more persevering growers have tested the cultivation of that fruit on a larger scale, and express themselves as quite satisfied with their venture.

Recently an amount of prominence has been given by means of views published in press reports to the non-setting of cherries in this State, which less superficial observations than could have been spared to the subject would no doubt have modified.

For some years past I have given to this question of the non-setting of cherry trees with us some attention in the proper season, and one of the first questions which presented itself to my mind was that the flowers might not unlikely be constitutionally defective where the trees proved unfruitful. The evidence of several examinations, with the aid of a lens, has hitherto been against that theory.

With the recurrence of seasons I am better satisfied now, as the young trees have grown into larger ones, that these same varieties which are unfruitful in the lower and warmer coastal districts, set and ripen their fruit in the cooler and higher localities of our South-West.

The same thing is noticeable in New South Wales, where cherries are a failure on the low country and bear enormous crops on the higher land of the Dividing Range. Cherry orchards of Armidale, Tamworth, Bathurst, the Canoblas, Orange, Grenfell, Young, Gouldburn, Yass, all on the Dividing Range or on spurs thereof, are noted amongst others.

In the course of a round trip I made early in November through the district extending from Katanning to Kojonup and the Gordon River, I had pleasing evidence that many of the young trees planted seven to eight years ago are bearing crops which increase every year and promise well for the future.

Since then I have received from Messrs. Piesse's orchard, from "Capemont"; Messrs. Beeck's orchard, at Katanning; and

also from Mr. McHenry Clark, of "Glenlossie," Kojonup, specimens of cherries which for size and appearance compare more than favourably with the excellent South Australian cherries imported by our fruiterers.

On the other hand, Mr. Hawter, of the Blackwood Nurseries, testifies to the fruitfulness of the young trees planted some few years ago in the Preston and the Blackwood districts. Mr. Geo. Swiney, the manager of Dr. Hackett's "Cherrydale" orchard at Donnybrook, is also emphatic on that point.

So impressed is Mr. Hawter with the possibilities of the cherry in the Blackwood that he planted last season some 20 acres, alternating peaches and cherries every 12 feet in the rows, which are 24 feet apart. In this fashion, if cherries are a success, in 10 or 12 years he will be able to root out the peaches, and if not, out goes the cherries, and still he is left with an orchard in full bearing.

Beyond the stretch of country mentioned above, young cherry trees have also been reported as having commenced to bear satisfactorily at Mundaring and at Wooroloo, on the Darling Ranges.

For the benefit of those intending to plant cherries, I will enumerate a few of the varieties which have proved fruitful in the localities named, and will approximately arrange them in the order of their ripening:—Early Lyons, Early Rivers, Chapman, May Duke, Black Eagle, Black Tartarian, Bigarreau Twyford, Bigarreau Rockport, St. Margaret, Bigarreau Napoleon, and Florence.

I have no doubt about other varieties as well proving profitable, and should growers be good enough to communicate their experience to me, I would submit a revised and a more complete list.

Of cherries alone, Western Australia imported last year 7,188 large crates of 56lbs. each, and the importation bids fair to be heavier this season.

Every single pound of cherries we consume we can grow locally, and I would strongly advise those settled in country and on soil favourable to the fruiting of the tree not to hesitate and make early preparation to plant largely when the season comes again.

Mr. Breen, our local inspector along the Great Southern Railway, and an officer whose duties enable him to become acquainted with every orchard along the vast stretch of country served by that railway, recommends stinkwood and sheaoak thickets where the soil is a light grey, sandy loam of good depth and well-drained. Some of the best cherry land, to my mind, is that found along the volcanic diorite or basaltic intrusions which here and there run through the country. Above all, avoid shallow soil with a retentive clayey subsoil, which remains for a long while cold in the spring at the time that the blossoms are out. A rich slope at an altitude 800 to 1,400 feet, with good soil and air, drainage, and in a latitude at least some 60 to 70 miles farther South than that of Perth, not too near the coast line, but not too far inland, and

within the 20-30 inch rainfall zone, will to my mind prove a most profitable cherry country. Such a country is met with along the line referred to in these notes.

As the proof of this report comes from the printer, I also receive from Mr. Geo. Swiney, of "Cherrydale," a tray of St. Margaret and Florence. The cherries are larger than anything imported, and are splendid in every respect. "I am gathering two and three 40lb. cases of cherries off some of the trees," says Mr. Swiney. Last year was the first time that these cherry trees bore anything to speak of, as they have, since planted, been gaining in strength and are of enormous size. . . . I am unable to name any cherry that has failed through its own fault, as, provided the soil is good and deep, all have done well that I have tried. . . . Unlike the drier inland districts, where sometimes the absence of late spring rains and the long dry summer cause the leaves to drop off the trees long before their time, they keep them well on here even until June."

INCUBATORS.

TANK v. HOT AIR.

By the EDITOR.

We have been asked on a number of occasions which was the best incubator to buy—one run by hot air or hot water. From a number of tests we have made personally, we are inclined to give the preference to a tank machine.

Still the tests have not been carried out sufficiently to warrant anyone in being emphatic on the matter. To start with, it must always be borne in mind that the trouble in England and America, where the machines are made, is to keep the eggs warm enough during the greater part of the year, while with us it is just the reverse. So that it is incumbent on us to thoroughly try both methods and see which can best be adapted to our climate. The two best machines made, so far, is the Hearson's hot water and Cypher's hot air. Incubators made in this State are generally on the lines of Hearson's. Those persons running incubators now, unless they are in some cool cellar, find the greatest trouble in keeping the heat down to 102 or 103. As a matter of fact, during the last hatch we had to take away the lamp every morning and put it back again about four or five in the afternoon, from the 15th day to the day the chicks were out, and, strange to say this was one of our best

hatches. A hot-water machine was used; now, had it been a hot-air machine, the leaving the lamp out so long must have allowed the machine to run cold, thereby exposing the eggs to some risk.

We invited our readers a short time ago to send in their experiences with their respective machines, but only a very few responded. We would again ask all those who have been using an incubator during the last season to send in all particulars, such as name of maker, size, where kept, average number of birds hatched, and number reared.

Some time ago we had occasion to write to Mr. J. H. Sutcliffe, of Ripley, Yorkshire, England, who is the author of "Artificial Incubation and its Laws," "Incubators and their management," "Profitable Poultry Farming," "Duck Farming," etc. This gentleman holds the position of being one of the best authorities in England on all matters appertaining to artificial incubation. In our letter we stated the uncertainty that existed as to the best machine. In his reply, received just as we go to press, he states:—

"I thank you very much for your letter. I will try to answer latter part first, *i.e.*, your query as to the best kind of heat, and which is most likely to suit the climate in your colony. I have for a long time tried to decide which type of incubators is, in my opinion, the best, and I have had great difficulty in doing so. I may sum up the pros. and cons. thus:—

"*Hot Water* are less liable to sudden or erratic rises or falls of temperature owing to capacity water has for retention of heat; but *Hot Air* with present regulators (and the capsule, not the thermostatic bar used in some, is the best) are quite safe, so the steadying effect of a volume of water is no great advantage.

"*Hot Water* tanks are liable to give trouble—leak, rust, etc.—and are expensive to repair; this, of course, after the first season or two.

"*Hot Air* are easily repaired. In fact, there is little to get out of order except possibly the heater, which is outside.

"The ventilation is about equal in amount, and I am a strong believer in ample pure fresh air to embryoes. Perhaps hot water gives a little more, but hot air gives enough, and hot water bottom to top causes a quicker and more drying passage or current, necessitating copious moisture to counteract. Hot air descending is steadier in volume and retentive of moisture given off by eggs; therefore these machines need less artificial moisture; in fact, in our climate none, but in your dry, hot climate they need helping as below:—

"Place a dish of wet sand in the Hot Air Non-moisture (so-called) machine. Keep moist, and also, as is done even here, keep a sand floor well moistened; in other words, artificially moisten the atmosphere. This where there are several incubators is very

necessary, and it is worth while going to the extra trouble. With one incubator, of course, a moisture tray inside is handiest.

"A good *hot air* machine, with its gradually descending volume of air, no draughts, and its retention of moisture given off by eggs, and assisted with a moisture tray or by artificially moistened atmosphere, I rather favour. Or, at any rate, these conditions will do as well in your climate as *hot water* with its copious water supply. At the same time, for absolute certainty in hands of novices, the Hearson type are the safest. I may appear to be contradicting myself. The fact is, Hearson's type have stood a long test. *Hot air* need improving in a way I have in hand just now, and some time before long I should like to send you 100 egg machine to prove. I would not, of course, send them till I have had a few hatches from the one I send. I have already had many hatches from experimental machines. My opinion of Cyphers is that though the moisture is retained sufficiently to prevent dryness, the vitrated air returns to machine only partially, in fact not sufficiently purified by diffusion with outer air. The experiment I have in hand got over this. But this is a digression and perhaps a little premature, though I have provisionally protected the improvement.

"Another point also. I could never get chicks so strong out of *hot water* as *hot air*; of course the difference is not great, but still decidedly perceptible. The chicks also come out in less time from chipping to get clear. I do not know why, but it is evident the conditions somehow are more natural.

"Notwithstanding all the above *hot air non-moisture incubators* you will have to assist them with moisture, and with the present Hearson type this is already supplied.

"Also *hot air* machines are capable of being made of larger size for obvious reasons; a 360-egg tank machine would be a cumbrous thing, 200-egg being the largest that should be made."

The following chapter on "Moisture in Incubators," by Mr. J. H. Sutcliffe, is taken from his book on "Artificial Incubation and "its Laws":—

"Experience proves that in incubators an artificial supply of moisture is necessary to secure the best results, for reasons previously stated. The egg contains all the water necessary for the chick's development within itself, the object in surrounding the eggs with a humid atmosphere being to prevent its dissipation by undue evaporation.

"Another highly important function performed by moisture is that of absorbing the liberated carbonic acid. At ordinary temperatures water will absorb its own volume of this gas. In summer more moisture is found to be advisable in incubators than in winter, and this is, sometimes, erroneously attributed to the supposed greater dryness of the air, whereas the atmosphere in summer generally contains much more moisture than in winter. By way of illustration, suppose the temperature of the summer air to be 70 degrees,

having a moisture capacity of, say, 10. Entering the incubator, this air is raised to 104 degrees, capable of containing, say, 20 degrees of moisture. Its drying capacity may, therefore, be represented by the difference between 10 and 20, that is, by 10. Now, take the air of winter at a temperature of 35 degrees, with a capacity for holding vapour of, say, only 1 degree. This air is also raised in the incubator to 104 degrees, with an absorbent capacity of 20 as before, its drying effect would thus be 19, or nearly twice as dry as the summer air. It is evident, therefore, that the extra artificial moisture required in summer, which is proved by experience to be beneficial, is not necessitated by the dryness of the warmer air. The probable cause is that, in summer, by the greater sluggishness with which the air is changed in the incubator, or the comparative slowness of ventilation, owing to the density of the outer air approaching more nearly that of the inner air, the carbonic acid (or, more strictly, carbonic anhydride) not being carried away as quickly, accumulates more rapidly, and requires more water to absorb it and to free the air of its narcotic presence."

It will be gathered from the foregoing, that it would be rather difficult to recommend either of these two machines. There is the one point, however, that Mr. Sutcliffe does not touch on, and that is the keeping it sufficiently cool in the Summer months. This is excusable, as he has not experienced our Summer heat. As matters stand, unless one has a suitable underground room, incubation has to be stopped for four or five months. With a cool underground cellar, however, the lamp may be put out in the morning and the water in the tank will keep sufficient heat in for the best part of the day. We hope before next season comes round to have something more definite to say to our readers on the matter.

Skim milk is good food for young chickens during the summer months.

Fowls are omnivorous eaters; that is they will eat nearly anything, and it has been demonstrated that food eaten by laying hens imparts its flavour to the eggs. A gentleman noticed his hens eating freely of onion tops that had been thrown into the poultry yard; for several days the eggs of those hens had such a strong onion flavour as to be unfit for use. Such food has been found to impart its flavour to the flesh also. It is important, therefore, that fowls have access to none but clean, good food. Filthy slops should be kept out of their reach, as should all decaying and unwholesome substances. Carcasses of dead animals should never be permitted to lie around where the fowls can get to them. The flesh of fowls that eat such stuff is not fit for food, neither are the eggs laid by them.

SAN JOSE SCALE.

At the close of the winter, the period best suited for treating scaly trees by fumigation, Mr. George W. Wickens submitted to the Department a report on the operations of the campaign against the San José scale in the Blackwood district, which is under his control, from which the following is taken:—

Before leaving the Blackwood district to take over the new duties alloted to me, I beg to submit for your information the results of observations I have made with reference to the attempted extermination of San José scale.

I find that with fumigation alone, as at present ordered by the Department, the pest can be kept in check but does not get appreciably nearer eradication, and to get at the desired end spraying must be carried out in conjunction with fumigation.

Of course, I am aware that with thoroughly air-tight tents and careful measurement of chemicals all trees so treated will in all probability be found free from scale.

But the great trouble from the orchardist's point of view, apart from the expense of purchasing tents ranging in price from £5 to £8 each, is the time required to fumigate thoroughly an orchard of any extent.

Farm labour is scarce, and nearly all settlers in this district go in for stock, hay, and grain, as well as orchards; consequently, during the winter months, when fumigation has to be carried out, there is a great deal of other work on hand at the same time.

Under the present system, the trees marked by the inspector as infested with scale and those growing near them are fumigated, but the remainder of the orchard is left without treatment. The trees that are fumigated usually have a few scales on them the following season, though occasionally I have found them perfectly free; but almost invariably, in orchards where the trees are large, fresh portions will be found infested each year. This is probably owing to the difficulty the inspector has, no matter how careful he may be, in finding all the trees on which scale has settled. As an instance, I may mention that a few weeks ago I was in an infested orchard, and in company with the orchardist. I spent a quarter of an hour searching a five-year-old tree, and just when we had come to the conclusion that the tree was clean, I found two half-grown scales sheltered safely beneath a bit of rough bark; the orchard comprises 25 acres of deciduous trees, and I hold the opinion that it is impossible to make sure of every individual scale being found when only one or two are present on a tree.

The point I wish to emphasise is the necessity of spraying the whole of the orchard with a strong winter spray, after the trees marked as infested have been fumigated.

If the choice lay between fumigation alone and spraying with lime, sulphur, and salt, I would favour spraying, because if an orchardist starts spraying he will, on account of the comparative speediness with which the work can be carried out, in nearly every instance treat the entire orchard; but I have found the tendency with fumigating is to do just as much as is ordered and no more.

I have in this district strongly advised spraying with lime, sulphur, and salt, after the fumigation ordered in form "B" was completed. I did not mention to the owners whose orchards I had under observation that I wished to make a particular test of methods, as I thought it would be better if the work was carried out under ordinary conditions.

In a previous report I mentioned the great success Mr. G. W. Hester met with in his efforts to free his orchard from San José. A great portion of that success was due to spraying. Mr. Hester did a great deal of fumigation, but finding it impossible to tent all the 13 acres infested, treated some of the trees which were badly attacked by scale with sprays only. These latter trees are amongst those which are now free from scale, the net results of the labour expended being a reduction from 13 acres to 14 trees.

Mr. S. Bevan, using an oiled tent in his own orchard, carried out the instructions issued last season *re* fumigation very thoroughly, and yet the number of infested trees increased from 28 in 1903 to 33 in 1904.

In carrying out the work for Mr. H. Davis, he (Mr. Bevan) fumigated the infested trees, and in addition sprayed the orchard with lime, sulphur, and salt. Result: A reduction in number from 13 in 1903 to none in 1904.

Mr. H. Doust, sen., last season fumigated all infested trees in his own orchard, and then sprayed all the trees with lime, sulphur, and salt. Result: A reduction in number from 53 in 1903 to 2 in 1904.

He also carried out the work in Mr. C. Doust's orchard adjoining, and trusted to fumigation only. Result: An increase from 2 in 1903 to 8 in 1904.

I know it is on record in the office that in the case of "Kalbyamba," where spraying was permitted, the scale increased greatly, but I am positive from observations I have made here that the spray must have been either very badly mixed or else badly applied; probably both.

I am not contending that fumigation of all the trees in an orchard is not the surest possible means of eradicating San José, but in orchards ranging from 15 to 30 acres it is too much to expect

orchardists to fumigate all the trees, whether found to be infected or free, on the chance of a few scales having escaped notice.

Another benefit derived in using winter sprays is the fact that spraying will kill the eggs of red spiders, whereas fumigation is absolutely harmless to the eggs of this insect.

In view of the foregoing, I would suggest that the future winter instruction should be :—"Fumigate all trees marked as being infected with San José scale, and spray all that portion of the orchard in which scale has been found."

In submitting Inspector Wickens' report to the Director of Agriculture, the Horticultural Expert, remarks that: "Fumigation, when carried out under suitable conditions, has, in most test trials, given better results than spraying; but as it is more costly and requires more time, and is almost valueless if not properly carried out, it has often proved disappointing.

"The suggestion that 'spraying' be done in conjunction with 'fumigation' would make success doubly sure, and, moreover, operate as a fungicide as well.

"Inspectors will exercise a certain amount of discretion in ordering treatment, as compulsory 'fumigation' is at times hard on orchardists who can ill-afford the expense at the time, or who have a host of other pressing work to attend to."

THE RABBIT-PROOF FENCE.

RABBITS RETREATING EASTWARD.

The Acting Director of Agriculture, who has just returned from a trip of inspection along the rabbit fence, is engaged on a very interesting report of his trip for the information of the Hon. the Minister of Lands. As it will not be available for this issue we reproduce a short sketch supplied to the Press, and trust to publish the full text of the report in our next issue:—

"The acting director of agriculture (Mr. A. Crawford) has returned from a fortnight's trip of inspection along the rabbit-proof barrier fence. He has a sorry tale to tell of motor-cycling in country such as that traversed by the fence, and having tried it he is to-day a wiser and perhaps a sadder man.

"The use of the motor-cycle in that country," he told an interviewer yesterday, "is out of the question. In clearing the 12ft. width along the fence, the scrub was simply cut down, and all the roots and large timber were left there, whilst in many places the

suckers have grown to a height of two or three feet. The result is that it is utterly impossible to see either the track or the roots. I got through a little over 100 miles, when my machine broke down. and I had to complete the journey on horseback and in a sulky. Another difficulty was that some of the hills are of very soft sand, and pushing a bicycle through them was difficult work. In fact, the whole contour of the country from the coast to Burracoppin is one continuance of large hills averaging from one to two miles in length. For about 120 miles from the coast the country is absolutely infested with poison, and there was evidence that large numbers of rabbits were dying through eating the plants. We came across the bodies of a good many that had apparently died from this cause.

"For nearly the whole way on the Eastern side of the fence the rabbits are fairly plentiful, judging from their tracks. The fence itself is in excellent condition, and we did not see a single weak portion during our whole trip. A curious thing is that the rabbits, which have got to the West of the fence, and which a few months ago were found to be 15 or 20 miles to this side, are now making East again. We saw numerous tracks on the Western side of the fence, where the rabbits were trying to scratch through and get back to the East. The rabbiters, who were some distance this side of the fence, have had to close in towards it in order to do any trapping at all. The Department intends to get a number of yard-traps put along the Western side, and these will catch the rabbits automatically. We have had to effect a remedy in connection with No. 3 contract. The fence for this portion was originally erected with the posts very wide apart and iron droppers in between, but it was found necessary to strengthen this part by the addition of two extra posts between the others, this being necessitated by the fact that in the wet weather if an emu or kangaroo collided with the fence the iron droppers yielded, and the structure was lowered to within 18in. of the ground. The additional posts are making a splendid fence, which the contractors are pushing on with. The emus do a deal of damage, and we saw several charge through the fence. Water along the route is rather scarce, and in most cases the distance between the rockholes is very considerable. The supply for the coming season is very small unless they get early rain, but there are splendid catchment areas of many acres of granite rocks where excellent wells can be made."

Do you think the fence will fulfil its mission?

"It is thoroughly answering its purpose, and if the outside barrier fence is thoroughly looked after and kept efficient, we will be able to stop the incursion. The boody rats are the greatest menace to the fence at the present time, and in three separate places I saw where they scratched right underneath the fence apparently within a few hours. The rabbits which were on the Western side of the fence will have a poor chance of increasing in numbers, as the domestic cat grown wild is very plentiful there, and the dingoes,

iguanas, and hawks also seem to attack the rabbits. For this reason, where cats or iguanas are found in the traps, the boundary riders release them. Another method by which hundreds might be destroyed is by setting fire to the scrub along both sides of the fence. I may say that the district is the worst-infested with poison that I have ever seen, and the bones of camels and horses along the track are reminiscent of pictures one sees of the African desert. The rabbits have very little choice of feed up to 60 or 70 miles of Burracoppin, for below that they have to subsist mostly on stunted scrub or else the poison."

EXPERIMENTAL WHEAT-GROWING.

By PERCY G. WICKEN.

I visited Moonyoonooka on the 24th inst. and inspected the experimental plots on Mr. Saunders' property. He had just finished stripping and was winnowing the grain. Each plot had been kept separate, the yields being as follows:—

Plot 1.—Manured with Japanese superphosphate, 2 acres $27\frac{1}{2}$ bushels; yield per acre, $13\frac{3}{4}$ bushels.

Plot 2.—Manured with Japanese superphosphate and sulphate of ammonia, 2 acres $38\frac{1}{2}$ bushels; yield per acre, $19\frac{1}{4}$ bushels.

Plot 3.—Manured with Japanese superphosphate and muriate of potash, 2 acres 35 bushels; yield per acre, $17\frac{1}{2}$ bushels.

This only includes the good marketable grain, and takes no account of the grain in the white heads, or the small grain taken out by the winnower. It is a good clean sample of grain, and Mr. Saunders has evidently taken trouble to get accurate results. This has been a dry season in this district, and the first rain of the season is said not to have fallen until 8th June, thus making seeding operations very late. The crop for experiment was sown on 23rd June and harvested 23rd November. It was new land and ploughed after the first rain and sown at once.

Mr. Saunders has a large area of wheat sown, the fertiliser he used being superphosphate 36deg. to 38deg. phosphate, at the rate of 100lbs. per acre, and he estimates his average yield of wheat at 13 bushels per acre.

Plot 1 therefore gave about the same returns per acre as the average crop, $13\frac{3}{4}$ bushels.

Plot 2, with the addition of $\frac{1}{2}$cwt. of sulphate of ammonia, at a cost of 9s., increased the yield by $5\frac{1}{4}$ bushels per acre, showing a profit of 6s. 9d. at 3s. per bushel.

Plot 3, with the addition of $\frac{1}{2}$cwt. of muriate of potash, at a cost of 8s., increased the yield by $3\frac{3}{4}$ bushels, showing a profit of 3s. 3d., at 3s. per bushel. These profits are over the average crop.

On 1st December I paid a visit to the wheat plots at Mr. F. Johnston's, at Dardanup.

The plots are ripening fast and I arranged with Mr. Johnston, if the weather is favourable, to harvest them on Monday, 5th December.

The crops appear very even, and in looking over the crop no difference appears between the different blocks, and it would be hard to forecast which plot goes most. Mr. Johnston has no stripper and will have to cut with a binder and thresh the grain. I arranged with him to first cut out a square 10 yards each way of the average product of each plot and to thresh this by hand and let me have the weights, and from the result of this, together with the total yield of the threshing machine from the six acres, we shall be able to arrive at a fairly accurate result. Mr. Johnston anticipates a 25-bushel per acre crop, but I am very sceptical as to this amount being obtained.

The block of land used is not too clean, and several dead trees, and one dead fallen tree among the crop, discount the advantage of the experimental work.

The wheat was sown on 20th June, 1903.

On 7th December I paid a visit to the Experimental Plots at Mr. St. Jack's, at Mount Barker. Considering the quality of the soil on which the wheats are sown they have done remarkably well. Mr. St. Jack's is situated some 12 miles to the East of Mt. Barker, and the soil which he is cultivating is looked on as very poor; the results obtained, however, prove that the appearance is deceptive. I forwarded to the Department a small bundle of seed heads of Sullivan's Early Prolific wheat, which seed we supplied him with for this experiment. They could hardly be beaten on the best soil. Of the three plots, that to which the nitrogen has been added promise to give much the best results.

Mr. St. Jack was away from home harvesting at the Millers' Estate, and the following day I went out to see him and made arrangements about harvesting. He has both a binder and a complete harvester. He will harvest these plots with the harvester and weigh the result of each plot separately and let us know the results as soon as possible. These plots are clean and have been carefully put in and should give reliable results. They will be ready to harvest about the end of this week.

PEAR-GROWING IN THE SOUTH-WEST.

By G. W. WICKENS.

I have noticed that orchardists in this district, during the last few seasons, are turning their attention to pear growing more than was the case in former years; and, considering the price obtainable in the local market for this fruit at the present time, and its probable value in the future when the canning industry becomes established, I think it is decidedly a move in the right direction.

Another advantage in planting pears is the ability of the trees to thrive in soils altogether unsuited for trees of a less hardy nature; and growers will find they can utilise their low-lying land, where stone-fruit would certainly die, and apples linger, by planting it out with pears. Even in stiff clay subsoil I have seen them doing remarkably well. When planting, it is advisable to mix the varieties, for some pears are self-sterile.

A few notes on varieties of which I have had personal experience may be of use to new settlers who are taking up fruit-growing for the first time.

Amongst the early pears the only variety I would advise planting is the "*Citron des Carmes;*" *it ripens early in December* in the Swan district, and would probably be ready for market in this district at about Christmas time, when it would command a ready sale and good prices; like all early pears it will not keep, and should be sent to market as soon as picked.

The best summer pear, and in fact the best known and appreciated of all pears, is the "Bartlett," or "William's Bon Chietien." For the grower it possesses one very big advantage over a number of other varieties in the fact that it is an early and heavy bearer; the trees usually commence fruiting at four years from planting, and at six they are bearing well. The fruit should never be left to ripen on the trees, for if that is done, in addition to an absence of flavour, it decays almost immediately.

"Kieffer's Hybrid" is a very handsome pear, and on account of its good looks sells readily; unfortunately it is not at all good eating, having a coarse flesh and acid flavour. For this district its main advantage would lie in its carrying capabilities. When ripe it is of a rich yellow colour, with a decided waxy appearance, and if the cases were packed tightly would travel from Bridgetown to Kalgoorlie without a bruise showing on the skin.

"Beurré de Capiaumont" is not as large nor as pleasing to the eye as "Kieffer's Hybrid," but as a compensation has a delicious flavour, and, being a variety that is lately becoming better known in the market, will pay well for planting.

"Vicar of Winkfield" has been planted largely by pear growers, the principal reason being the great crops borne by the trees. It is not an easy matter for a person unacquainted with this pear to know just the right time at which to gather it. As they approach ripeness they fall rather badly, but if picked before fully mature they shrivel in storage; to avoid this it is necessary that they should remain on the trees until the fruit's usual bright green colour has shaded into a very pale yellow. Even when ripened under the most favourable conditions it is not a good dessert pear, but is first rate for cooking.

"Josephine de Malines" is one of the nicest dessert pears in cultivation, but the tree requires good soil and attention or it will become stunted and the fruit loses in quality.

I do not claim in the foregoing to have mentioned all, or nearly all the varieties which may be grown profitably, but intending planters may rely that those mentioned are amongst the best.

I have noticed that some of the old pear trees in and around Bridgetown are badly affected with *fusicladium*; a number of trees that had an abundant crop of blossoms failed to mature their fruit on account of this fungus. When taken in time and preventive sprays used, this disease, if not entirely eradicated, can at any rate be kept in check. When it has obtained a firm hold two winter sprayings with strong bordeaux mixture will be found necessary, the second spraying to take place immediately before the leaves burst. Another spraying, using summer strength of solution, should be given as soon as the trees break into leaf, and yet another when the blossoms have dropped. This, no doubt, seems a great deal of trouble, but any grower having the disease in his orchard will find himself amply repaid for the labour.

To conclude, I may mention that specimens of the size pear trees will reach in the South-West can be seen at Mr. William Brockman's orchard at the Lower Warren. Two pear trees, 40 years old, are 50ft. high, and measure six feet in circumference at the stem. Three tons of fruit have been marketed in one season from these two trees, without taking any account of the amount the birds destroyed and those that fell during the period of ripening.

Eggs should be kept in wholesome atmosphere. The egg-shell is porous and admits of the absorption of odours which impair the quality of the egg and render it unpalatable if not actually unwholesome.

THE COTTON-GROWING INDUSTRY.

A large deputation of Federal members recently waited on the Minister for Customs to urge that encouragement, by way of a bonus, should be given to the establishment of the cotton-growing industry in Australia. The members present were Messrs. Wilkinson, Edwards Groom, Fisher, Bamford, and David Thomson (Q.), Hume Cook (Vic.), Sir William Lyne, and Mr. Chanter (N.S.W.), Storrer (Tas.), Sir Langdon Bonython (South Australia), and Senators Givens and Stewart (Q.). Ten other members apologised for their absence.

It was urged that cotton could be successfully and profitably grown with white labour in Queensland, New South Wales, the Northern Territory, and West Australia. The cotton industry would one day surpass the wool and sugar industries, and become the leading industry of Australia. About one-half of the Australian continent was suitable for cotton growing, and country comparatively useless now could be profitably turned to account Efforts to establish the industry in Queensland in the past had failed, but that was largely because bye-products were not utilised, and also because they did not have a regular service of vessels to other parts of the world or means of getting on the world's market at the best time. On one occasion 26 million pounds of cotton were sent to the English market. The shipment realised top price, but it did not pay, because they only took the lint off, and two-thirds of the crop went to waste. Under modern conditions those two-thirds would be utilised. If an oil-pressing plant were established (and Messrs. Kitchen had stated their willingness to put up a plant if sufficient raw product were forthcoming), there was a splendid chance of starting a castor oil industry. The castor oil plant grew wild in Queensland.

Mr. McLean said he was very pleased that the representatives of all the States were taking such a keen interest in this important industry. One of the first questions they had to solve was whether the cotton industry could be successfully established by white labour. He would have to get some information before he could pronounce an opinion on that, but so far all the information he had got was favourable to the assumption that it could. One of the likeliest indications for the success of the industry was that the world's demand was increasing over the world's supply. So much so that during the last six years the price of raw cotton had doubled. In Great Britain they had been unable to get sufficient to keep the spindles working full time, despite the fact that Great Britain's export trade of the manufactured article amounted to 73 millions sterling. Last year Great Britain paid £750,000,000 for the quantity of raw material she was able to get. These facts

pointed to the conclusion that there was a great future before the cotton industry; but before entering into obligations in Australia that would involve considerable expense it was necessary to look much deeper into the matter, and see whether the industry could be successfully established with white labour. The intention of the Government was to get all the information it could, and a conference with the States to consider the question, in conjunction with other industries, such as flax, vegetable oils, etc., gave promise of success. It was better that they should not go to the States with a cut-and-dried scheme. The soil and climate of Australia were suitable for the production of cotton of a first-class standard, and if it could be successfully established there was no reason to believe that it could not be established on a very large scale.

SPECIAL PRODUCTS OF THE FARM.

Compiled by the EDITOR.

(Continued).

Preparation of the soil.—The best time for ploughing is the autumn, the plough being first run six to seven inches deep and followed by a subsoiler regulated to tear the ground another six or seven inches, thus breaking the arable soil to the depth of twelve to fourteen inches, which is about the average length of a sugar beet root. The land is left in this rough condition all through the winter, and is again ploughed—not subsoiled—in the spring, and prepared for sowing by means of harrowing and rolling. Should the ploughing be delayed till the spring, a quantity of bad seeds will be brought to the surface, which, germinating at the same time as the beet, will over-run the ground and smother the crops; while, on the other hand, if the soil be ploughed in the autumn the seeds which germinate in the early spring are killed by the second ploughing, harrowing, etc., which precede the sowing.

Preparation of the seeds.—The seeds are very often "pickled" or soaked previous to the sowing, especially when they are not quite fresh; and the planting takes place in the spring, whenever the temperature reaches about 55deg. to 60deg. F.; in the New England district by the end of September. The germinating faculty is materially increased by soaking in water at 100deg, to 120deg. F. for twenty-four to thirty-six hours, and the beets thus treated show a

more even growth than when the seeds are not soaked. Prolonged immersion, however, in pure water, might remove from the seeds some of their soluble constituents, and for this reason the seeds are often steeped in the juices flowing from the manure heap, which are diluted with about an equal volume of water. A mixture of urine and water in equal parts is just as good. The seeds, during this time, having absorbed about their weight of water, are taken out, mixed with ashes—superphosphate of lime is often added to the ashes—dried on the surface, passed over a screen, and used for sowing.

Germination of seeds.—Few crops have been so thoroughly studied as regards their requirements, and the treatment they should be subjected to, as the sugar-beet. Experiment has shown that in a soil well prepared and sufficiently moist and aerated, the seeds require for germination a total of degrees of average temperature equal to 650 deg. F. Thus, if the average daily temperature be 55 deg., twelve days will be required for germination; if 65 deg., only ten days will be required. Should the seeds be steeped for thirty-six hours in water, or the liquid from the manure-heap warmed to 100 deg. or 120 deg. F., the number of days required for germination will be correspondingly reduced, and only nine to ten days will be occupied. The same principle holds good for the germination and the ripening of many of our economic and ornamental plants.

Manures.—In the rich volcanic or alluvial soils of the New England district, no immediate manuring will be required, except on land which has been under crop for a great number of years. When, however, manure has to be applied, it should not be too new, but thoroughly rotten, in order that the beet roots may not be caused to fork out by coming in contact with hard straw. This forking or branching prevents proper maturing. For this reason, stock-yard manure is not directly applied to the beet-root crop, but to the cereal crop which precedes it. Artificial fertilisers, such as superphosphate of lime, are often used instead of stock-yard manure, and may be applied at the time of sowing, either separately or mixed with the seeds. In the case of soluble nitrogenous manures, such as nitrate of soda or sulphate of ammonia, it is always advisable to apply them when the seeds have germinated and the plant is able to utilise them. Manures in which the phosphoric acid is to the nitrogen in the proportion of two to one give very good results as regards the production of sugar in the crop.

Sowing.—For experimental purposes, sowing may be done by hand, but when beet growing is attempted on an industrial scale, a seed drill should be used, which delivers the seeds regularly, without waste, and facilitates the subsequent method of cultivation and harrowing. The seeds are sown thickly, at the rate of 16 to 20lb. to the acre, in lines 10 to 14 inches apart, and not more than one to two inches below the ground, a light roller being run on the ground after the sowing. Experiments have shown that at that depth a

higher percentage of the seeds will grow than at any other. Also, that close planting gives:—

Roots richer in sugar;
Containing less saline and organic matters.

Hence, it is less exhausting to the soil, and produces heavier crops. The inference is that close culture is more profitable, both to the grower and to the manufacturer. In drier localities, the distance between the rows might be increased to 16 or 18 inches each way, so as to allow to each plant a greater superficial area for drawing moisture from, and also for diminishing the evaporation through the leaves. For this State, where hand labour is so expensive, it might be considered a good plan to sow a little wider apart—say 18 to 20 inches between the rows—so as not to impede the operations of horse howing and sowing 18 to 20 inches apart, whilst restricting the distance between the plants in the line to nine inches. The thinning should be carried out when the plant has grown two to four leaves. Hoeing is begun as soon as the plants show above the ground and mark the row, and is constantly carried on at intervals of a fortnight as long as the leaves will allow. Early and constant hoeing is strongly to be recommended, as it destroys the weeds when they just show, and also keeps the surface of the soil well pulverised, thus checking the excessive evaporation in the daytime by breaking the continuity of the capillary action in the ground, and besides favouring the absorption of the moisture and dew during the night. After a dry summer a few seed stalks may appear in the field, and should be removed.

Ripening.—The sugar-beets begin to mature in the autumn, and this is shown by the leaves turning yellow and drooping. The roots are then fit for pulling, which is done either by hand, after the root has been loosened by the assistance of the pick or the plough, or by machines which have been devised for the purpose. At all events care should be taken not to bruise or cut the root, which would then decay when stored or heaped up in silos. The leaves are removed from the roots in the field by means of a sharpened bill-hook, the earth shaken off, and the roots heaped up and covered with their leaves till carted away to the stack or silo.

Stacking.—The beet-roots are either delivered at once to the sugar factory or stored for some time. For this purpose, they should be stacked or heaped up in trenches or cellars which should not be too dry, or the roots will wither, nor too damp, or they will rot. The roots should, moreover, be protected against frost, but a high temperature is highly undesirable, as favouring the sprouting of the roots and their fermentation; good ventilation, and means of carrying away of foul air and the carbonic acid gas disengaged from the mass of heaped up roots, should also be provided.

FOWL CHOLERA.

By ARCHIBALD R. WARD.

The following valuable article on fowl cholera has been published in bulletin form by the College of Agriculture, California, and is reproduced in the *Journal*, in hope that it may be the means of preventing any loss to our poultry keepers :—

Poultrymen in the United States frequently report losses from fowl cholera, but nevertheless very few opportunities to make careful study of an outbreak have been afforded to those charged with the duty of publishing information on the prevention of poultry diseases. Salmon, about 1880, reported a disease in South Carolina, which he believed to be identical with the fowl cholera of Europe, described earlier by Perroncito, Pasteur, and others. The undeveloped condition of methods of bacteriological investigation at the time prevented that writer from furnishing conclusive evidence of the identity of the European and American diseases. Moore, about 1894, obtained sick and dead birds from three outbreaks of a disease popularly called fowl cholera, but found that the disease observed by him was not the fowl cholera of Europe. Some time afterwards he published a description of this new disease, giving it the name "infectious leukæmia." Higgins in Canada reported an outbreak of the true European fowl cholera. Friedberger and Fröhner (Hayes translation) use the names fowl cholera and fowl typhoid interchangeably, in their description of the disease more commonly known by the first designation. Curtice has very recently published a bulletin dealing with the disease described by Moore, but calls it fowl typhoid. The essential facts concerning the symptoms and recognition of these two diseases have been brought together in chapters of a book written by Moore.

In America, opportunities for making an accurate diagnosis of fowl diseases, reputed to be "the cholera," have been rare. This may be charged principally to the familiar disinclination of poultrymen to admit the existence of disease among their stock. Neither of the American writers on fowl cholera, cited above, report field trials of repressive measures.

Fowl Cholera in California.—In October, 1903, a poultryman reported to the Agricultural Experiment Station that severe losses from "the cholera" were occurring upon his own and other ranches in Marin County. The presence of the disease was brought to his notice three weeks before by twelve dead hens being found under the roosts on one morning. On the second day as many more were

found, after which, deaths practically ceased for a week, when losses again occurred at the rate of from six to ten a day. In the three weeks from the start the disease had spread to four adjoining colonies, and about one hundred fowls had died during the time.

The request of the poultryman for advice was met by an extended visit at the ranch to study the nature of the disease and to suggest repressive measures. The symptoms of the sick fowls, the internal alterations resulting from the disease, and a bacteriological examination led to the conclusion that the true fowl cholera had been encountered. The serious foothold already gained among five colonies, comprising nine hundred fowls, necessitated prompt action to prevent its spread to the remaining two thousand fowls.

The poultry ranch in question was stocked with about three thousand fowls distributed over several hundred acres of land in colonies containing about one hundred and seventy-five fowls. Each colony was supplied with roosting houses, a laying house, a grain-feeding hopper, feeding troughs, and drinking-water fountain. The several colonies were near enough together so that those hens venturing fartherest abroad during the day would intermingle with those from other colonies—a fact of significance in relation to the spread of the disease. The writer has observed hens to go several colonies from home attracted by the feed in the wagon from which the daily rations were distributed.

An experiment was performed to determine the length of time elapsing between exposure to infection and death. Ten cockerels were selected from one of the colonies that was free from disease, and, as subsequent events proved, so remained. All were placed in a crate, and were allowed to eat freely of the entrails and flesh of a fowl dead of the cholera. The dates of death are recorded in the following table:—

TABLE I.

Deaths after eating Infectious Material.

Fed viscera of dead fowls on October 11.

	Date of Death.
No. 1	October 12, early in morning.
No. 2	October 13, 5 p.m.
No. 3	October 17.
No. 4	October 13, early in morning.
No. 5	October 12, 1 p.m.
No. 6	October 15, during night.
No. 7	October 13, during night.
No. 8	October 16.
No. 9	October 14, 8 a.m.
No. 10	October 12, 1 p.m.

As each one died, an examination of the internal organs was made, and conditions were found identical with cases that contracted the disease naturally. The experiment shows that the disease is very rapidly fatal, a large percentage dying within three days after exposure. The results demonstrate most emphatically the necessity

for the immediate disposal of dead fowls to prevent the infection of other fowls by eating their carcases.

Prevention must be the fundamental idea of all methods of dealing with an infectious disease like fowl cholera. In consequence, measures directed against it must be based upon a knowledge of the ways by which it is naturally spread from one individual to another. The fact that the blood at death teems with the bacteria of fowl cholera signifies that any part of the flesh or entrails is dangerous to other fowls when eaten. This fact was demonstrated in the experiment with the cockerels, all of which died within a week after eating entrails of dead fowls. The occurrence of extensive alterations in the walls of the intestine permits the mixture of blood with the contents of the intestine. Consequently the bacteria of the disease are present in the manure, thus rendering it a most serious factor in the spread of the disease. The probability of this material being mixed with the food by the feet is always to be considered.

Another way by which a sick fowl may spread disease is by means of the liquid that drips from the beak in some cases. As sick fowls are thirsty and frequently drink, there is opportunity of contaminating the drinking water. Since all sick fowls are a source of danger to others their immediate slaughter is imperatively necessary.

Measures designed to control the various sources of infection were put into operation as promptly as circumstances indicated the necessity for them. No information was available concerning the relative importance of the various possible sources of infection. Consequently the preventive measures were experimental in nature to a certain extent and were elaborated somewhat from time to time. Table II., on page 9, shows the date of inauguration of the various measures, with their apparent effect upon the death-rate.

The infectious nature of the disease indicated the necessity for thorough and frequent spraying of poultry houses with some substance capable of destroying the bacteria of the disease and of minimising the number of parasites that might spread the infection. A mixture of crude carbolic and crude sulphuric acids was used for some time, but later the sulphuric acid was replaced by phenolene. It was deemed best to spray all of the poultry houses on the ranch daily, without reference to the distribution of the disease.

Mr. H. O. Woodworth, foreman of the California Poultry Experiment Station, personally took charge of the application of the disinfectant, and the enforcement of other sanitary measures. He kept a record of the death-rate, and from time to time changed the composition of the disinfectant. Notes on the sanitary control of the cholera, suggested by his experience, follow :—

"A disinfecting solution recommended in publications of the Bureau of Animal Industry was selected for spraying in the roosting and laying houses to destroy the infectious material. Dr. D. E.

Salmon describes its preparation, in Farmers' Bulletin No. 24, U.S. Department of Agriculture, as follows:—

"'Crude carbolic acid, ½ gallon; crude sulphuric acid, ½ gallon. These two substances should be mixed in tubs or glass vessels. The sulphuric acid is very slowly added to the carbolic acid. During the mixing a large amount of heat is developed. The disinfecting power is heightened if the amount of heat is kept down by placing the tub or demijohn containing the carbolic acid in cold water, while the sulphuric acid is being added. The resulting mixture is added to water in the ratio of 1 to 20. One gallon of mixed acid will thus furnish twenty gallons of a strong disinfecting solution, having a slightly milky appearance.'

"A small bucket spray-pump was used to apply the disinfectant. The spraying outfit, together with a barrel of the disinfectant, was moved on a sled from one colony to another. The liquid was sprayed upon the floor, side walls, and perches of the roosting houses and upon the floor, and side walls up to the nest, of the egg houses. The ground was sprayed for several feet around the houses. Especial care was paid to the shady side where the chickens spent considerable time during the day. The infected colonies were all sprayed daily from the 9th to the 15th of October inclusive. All the other colonies were sprayed daily except Sunday.

"On the 16th, it was decided to change the spraying solution, on account of several objectionable features of the one in use. The spray affected the eyes so that the man doing the work could not go into the houses and do as thorough work as should be done. Further, the mixture made the hands sore, ruined clothing, and destroyed the rubber hose used on the spraying pump after a few days' use.

"Crude carbolic acid alone was then used in a strength of one gallon to twenty gallons of water. The houses of the infected colonies were sprayed with this mixture from the 16th to the 20th inclusive, the houses of the other fowls being sprayed on the 17th and 19th only during the same period. It was found very difficult to keep the mixture sufficiently agitated to insure a uniform spray, so another change was made on the 21st.

"The mixture next adopted consisted of one-half gallon each of phenolene and crude carbolic acid to 20 gallons of water. This proved satisfactory, except that it injured the hose somewhat.

"To spray the 60 houses and surroundings thoroughly once required 40 gallons of disinfectant. To make this amount there were used one gallon of sulphuric acid, at 60 cents, and one gallon of crude carbolic acid at 50 cents. Thus the expense for material was \$1·10, or slightly less than two cents. a house per day. To do the same work using crude carbolic acid alone, costs \$1 a day. The last mixture used, and which experience showed to be the best to handle, is the cheapest. This mixture costs 50 cents for the gallon of crude carbolic acid, and 20 cents for the gallon of phenolene.

The daily expense per house with the carbolic-phenolene mixture was thus a trifle over one cent. The spraying was continued 25 days, and the expense for all the materials for this time was \$21·10. Had the carbolic-phenolene mixture been used for the whole time the expense would have been \$17·50. The carbolic-sulphuric mixture would have cost \$27 for the same length of time. The labour required to spray 60 houses each day consumed four hours' time for two men and a team."

The roosting houses were cleaned once a week, and the manure was placed in a part of the ranch where there would be no possibility for it to contribute to the spread of the disease.

When fowls are fed from open troughs, or when the feed is placed directly on the ground, there is a strong probability that the feed may become contaminated from the droppings of sick birds. The practice of feeding from open troughs was discontinued. Troughs were made so as to permit the fowls to reach the head in, but to prevent the feet from coming in contact with the feed.

On account of the danger to the fowls from the contaminated ground about the houses, the five infected colonies were moved on October 14th to another part of the ranch.

The practice of slaughtering all hens sick of the cholera was inaugurated promptly; but as the disease was noticeable for only a short time before death, many had opportunity to spread infection before detection. On October 17th (*see* Table II.) it was decided to kill every hen that showed the slightest symptoms of any sort of disease. It was found very desirable to visit the roosting houses at daybreak, for at that time the sick ones are almost certain to be found lingering in the houses. The early visit also permitted the collection of the dead before the living could become infected by eating portions of them. For the purpose of restricting the possibility of fowls becoming infected from the droppings in the houses before the daily spraying, it was made the practice to drive out the hens early in the morning and to shut the doors until after the spraying.

The dead were burned or buried deeply, as convenient. Scrupulous care was exercised to dispose of the dead before the living fowls could molest them.

A number of fowls among those frequenting the vicinity of the house and barns were lost from the cholera. Two turkeys also died within a few hours after they were first noticed to be sick. These birds had abundant opportunity to catch the disease from sick and dead ones brought from the infected colonies. The few fowls about the house were caught and placed with one of the infected colonies.

On October 20th it was deemed necessary to place in the drinking water some substance known to be fatal to the fowl cholera bacteria and thus insure drinking water free from danger of communicating the disease. It was decided to use corrosive

sublimate in the drinking water of the infected colonies, as suggested by Ritzer. That substance is a violent poison to most creatures, and there was some fear that it would have an undesirable effect upon the egg yield, if no worse would result. Stoneware drinking fountains were used, because the corrosive sublimate would have combined chemically with the metal drinking fountains in common use. For convenience in making up the solution of the desired strength, corrosive sublimate and ammonium chloride in the form of compressed antiseptic tablets, prepared by John Wyeth & Bro., were used. The tablets contain such an amount of corrosive sublimate that one tablet in a pint of water makes a 1 to 1,000 solution, making the preparation of a solution of any weaker strength a simple matter.

Mr. H. O. Woodworth has written the following paragraph, giving information regarding the strength of corrosive sublimate solution used:—

"Corrosive sublimate in the strength of 1 part to 1,000 parts of water (16 tablets to a two-gallon drinking fountain) was used on October 21st, but it was observed that the chickens did not drink freely of the mixture. The next day 13 tablets to the two-gallon fountain were used, which mixture the fowls drank more freely. Largely from fear of evil consequences of the use of a strong solution, it was decided to further dilute the corrosive sublimate, using eight tablets to two gallons of water, or a dilution of 1 to 2000 parts of water. This strength of solution was supplied the infected colonies on October 25th and 26th. The same was used from October 30th to November 5th inclusive. No injurious effects were noted. A decrease in the egg yield may possibly have been due to its use. A word of caution should be uttered regarding the danger of too free use of corrosive sublimate, on account of its poisonous properties. The cost of purifying the water with corrosive sublimate was $7·59 for the whole period."

Corrosive sublimate was used in the drinking water solely for the purpose of killing any of the bacteria of fowl cholera that might gain access to it, thereby eliminating one of the possible sources of infection. It was not used as a medicinal remedy.

The control of the drinking water of the fowls is a comparatively simple matter in the dry season. An outbreak in wet weather would present much more serious difficulties, for every puddle of water on the ground is more than liable to be contaminated from the droppings. Under such conditions fowls would catch the disease much more readily.

The writer made no suggestions regarding the character of the feed to be supplied, as that matter was regarded as having no bearing upon the problem.

An example of the relation of a stream of water to the spread of fowl cholera has come to notice. A poultryman whose fowls had been free from the disease noticed one evening that several dead fowls had drifted ashore from the creek running through his ranch, the next morning the carcasses were found stripped to the bone, partly eaten by skunks during the night, and later by chickens from a near-by colony. Fifty-eight fowls in the same colony died during a day and a night. The entire colony was disposed of promptly, but not until one hundred had died. No further trouble was experienced. At least two ranches up stream were known to be infected with the disease, which suggests an explanation for the presence of dead fowls in the stream.

The spread of the cholera on a ranch is often greatly hastened by the poultryman, through failure to recognise the necessity for isolating affected fowls. An interesting case has come to notice. The fowls in a colony along the roadside became infected from dead fowls that had been thrown into the ditch, a number of dead fowls from that colony were brought to the house, where they were allowed to remain exposed long enough to start the disease among the two hundred fowls frequenting the vicinity of the house; with the hope of stopping the disease by moving these fowls, they were placed in a colony by themselves, the isolation from other fowls was not complete, and the infection spread; disinfection was practised intermittently and the dead were not gathered up promptly. Six months after the introduction of the disease losses continued. The owner estimated that at least one thousand fowls had died during the period mentioned.

The experience of another poultryman in the neighbourhood furnishes information worthy of record. After having his stock of fowls depleted by the ravages of the disease, he determined to replace the losses by purchase of healthy fowls. As the disease existed in practically every colony at the time, the problem of introducing fresh stock was a serious one. The owner decided to make the attempt in a field containing three colonies in which eight hundred and seventy fowls had been lost out of thirteen hundred and fifty originally there. The survivors were removed to other colonies on the ranch, the houses of the three colonies were cleaned, whitewashed, and the floors sprayed with phenolene, each of the three groups of houses was moved about two hundred yards from its former location and was left untenanted for two weeks, nine hundred and fifty fowls were then distributed among the houses and no cholera appeared among them. That the field in question was quite isolated from other infected colonies is believed to be another factor that contributed to the happy result.

Symptoms.—The yellow colour of the droppings is the first noticeable symptom. The yellow material consists of the kidney excretion (urates), which is apt to soil the feathers covering the abdomen, a condition that should be looked for in suspected cases. Diarrhœa appears later. The character of the dung varies

considerably in colour and consistency. Sometimes it is a pasty greenish mass, or a brownish red mucus, or a viscous transparent fluid. The yellow colour of the urates is the most noticeable feature.

The sick fowl gives evidence of its condition by an unnatural attitude of the feathers, and by a disinclination to move about as usual. None were observed to eat during the later stages of sickness. Thirst is frequently present, for fowls were observed to drink copiously in the advanced stages of the disease. A mucous discharge from the mouth was occasionally noticed. Toward the end, drowsiness is very marked. The temperature in advanced stages of naturally infected cases varies from 109° to 112° F. (42·8° to 44·4° C.). The temperatures of several fowls inoculated with cultures are tabulated below. Nos. 1, 2, and 3 were inoculated subcutaneously ten hours previous to taking the first temperature. No. 4 was inoculated seventeen hours before the first temperature was taken. In each case death occurred during the night following the last recorded temperature, except in the case of No. 3, which died twenty-four hours later. Approximately, 0·01 c.c. of a 24-hour bouillon culture was injected in each case.

TABLE III.

Temperatures of Inoculation Cases of Fowl Cholera.

	No. 1.	No. 2.	No. 3.	No. 4.
March 18, 9 A.M. ...	41·1° C. ...	41·3° C. ...	41·9° C. ...	43·4° C.
10 A.M. ...	41·7 ...	41·3 ...	41·7 ...	42·6
11 A.M. ...	41·7 ...	41·3 ...	41·6 ...	43·2
12 M. ...	42·3 ...	41·3 ...	41·6 ...	44.1
1 P.M. ...	43·0 ...	41·1 ...	41·8 ...	44·0
2 P.M. ...	42·7 ...	41·0 ...	42·0 ...	43·8
3 P.M. ...	42·4 ...	40·4 ...	42·0 ...	43·6
4 P.M. ...	42·2 ...	40·6 ...	41·8	
5 P.M. ...	41·9 ...	40·6 ...	42·0	
6 P.M. ...	42·4 ...	41·4 ...	42·0	
7 P.M. ...	42·2 ...	41·2 ...	41·0	
8 P.M. ...	43·1 ...	41·6 ...	41·2	
March 19, 11 A.M. ...	41·4		43·0	
12 A.M. ...	40·8		42·7	
1 P.M. ...	40·4		42·6	
2 P.M. ...	40·7		42·4	
4 P.M. ...	40·0		42·8	
March 20, 10 A.M.			42·8	
12 A.M.			42·2	

The temperatures observed in cases 1, 2, and 3 rarely were high enough to be regarded as febrile. Numerous observations on healthy fowls show that the normal temperature of healthy fowls most often lies between 41·7° C. and 42·2° C. A considerable number of apparently healthy fowls exhibited temperatures as high as 42·8° C. No. 4 exhibited a distinctly febrile condition, and corresponded better than the others with the temperatures of naturally infected fowls observed during the study of the disease in the field.

In the majority of cases in which the time of exposure to the disease was known, death occurred within three days. The tabulated results of the inoculation of fowls by the ingestion of infectious material, page 507, show that the incubation period may be as short as eighteen hours in cases infected by natural means. Sickness was seldom noticed more than twenty-four hours previous to death. All the cases that came under the writer's observation were acute. No recoveries were noted. The fact that more deaths occur on the roosts at night than in the day time was noticeable.

Fowl cholera cannot be certainly recognised by the poultryman without the aid of a bacteriological examination, but at the present time this fact is of no significance. The methods of combating the cholera are practically not different from those that should be applied in the other plagues of poultry closely resembling fowl cholera. The occurrence of numerous sudden deaths among fowls is indicative of an infectious disease, and should be the signal for the inauguration of sanitary measures.

Changes observed in the various organs, upon post-mortem examination, are comparatively slight; a circumstance not surprising, in view of the brief period of sickness. A technical description of the alterations, unprofitable to the general reader, is appended.

OBSERVATIONS UPON THE PATHOLOGY OF FOWL CHOLERA.

At death, or some hours previous, the comb frequently takes on a dark purple colour, but this does not always occur. Very often the comb is pale and bloodless. The skin of the breast and abdomen is frequently reddened.

In post-mortem examinations a congestion of the blood vessels of the liver, kidney, mesentery, or intestines is noticeable to some degree in all cases. Punctiform hemorrhages are found upon the heart with almost absolute uniformity. The liver is very frequently marked with punctiform whitish areas of necrosis. Stained sections show these necrotic foci throughout the substance of the liver, and besides reveal a congestion of the blood vessels of that organ. The next most striking lesions occur in the first and second duodenal flexures. The mucosa is deeply reddened and studded with hemorrhages varying in size, but seldom exceeding one millimetre in diameter. These involve the intestinal coats to an extent that makes them distinctly visible on the peritoneal surface. The contents of the duodenum consist of a pasty mass, more or less thickly intermingled with blood clots. The intestinal contents sometimes consist of a cream-coloured pasty mass, or may be brownish red or even green in colour. Lesions are very rarely observed in other portions of the intestines. The ureters are noticeable in practically all cases by reason of the yellow-coloured urates that they contain. The nasal cavity, pharynx, and oral cavity frequently contain a viscous mucous fluid, probably regurgitated from the crop.

The field notes on twenty-one post-mortem examinations reveal reference to the hemorrhages upon the heart in twenty-one cases; punctiform necroses of liver, fifteen cases; hemorrhages in duodenum, seven cases; and discoloration of skin in six cases. The presence of a gelatinous exudate within the pericardium was noted twice. A fibrinous exudate in the pericardium occurred the same number of times. Hemorrhages in the peritoneum other than those visible through the mucosa of the duodenum occurred but twice. In one case hemorrhages were abundantly scattered throughout the muscles of the trunk and legs.

Fowls inoculated subcutem with cultures exhibit, on post-mortem examination, the punctiform hemorrhages on the heart and the hemorrhages in the mucosa of the duodenum exactly as in cases infected naturally.

Two turkeys fell victims to the disease. The symptoms and lesions did not differ markedly from those in hens. Notes on the post-mortem examinations of these cases are appended:—

October 14. Hen turkey observed to be sick. Temperature about two hours before death, 112·6° F. (44·8° C.), no reddening of skin. Heart muscle contains some punctiform hemorrhages. The cæca, mesentery, and intestine are covered with a yellowish fibrinous exudate. The intestines contain dark, pasty fæces. The vessels on the peritoneal surface of the gizzard are congested. The lungs, proventriculus, intestines, kidneys, and spleen are not visibly altered.

October 14. Gobbler, found soon after death. There is no discolouration aspect of skin. Lungs are congested and dark red in colour. The dorsal of the lungs is covered with a gelatinous exudate, which liquifies upon exposure. The œsophagus and crop are normal. The proventriculus contains a greenish, transparent, gelatinous substance mixed with blood clots. The gizzard contains a few blood clots. The mucosa of the intestines, from the gizzard as far as the cæca, are congested. The duodenum contains yellowish, pasty mucus, with occasional clots of blood. The cæca are distended with material of normal appearance. Vessels on the peritoneal surface of the duodenum and of mesentery are congested.

Blood Counts.—In comparing the lesions of infectious leukæmia and of fowl cholera, Moore has pointed out the desirability of a study of the blood in the latter disease. Consequently the opportunity was seized to make the blood counts tabulated below:—

TABLE IV.

*Blood Counts of Fowls Infected by Ingestion * and Infected Naturally.*

Fowl.	White.	Red.	Remarks.	Temperature.
No. 3	23,000	2,299,000	3 days after exposure to infection	44·8° C.
No. 3	20,000	2,800,000	4 ,, ,,	43·7° C.
No. 6	37,000	3,930,000	3 ,, ,,	43·3° C.
No. 8	87,000	4,490,000	3 ,, ,,	42·8° C.
No. 8	101,000	2,960,000	4 ,, ,,	42·2° C.
A	58,000	1,710,000	Naturally infected	42·8° C.
B	45,000	1,925,000	,, ,,	...

* Details of the method of infecting these fowls are given on page 509.

TABLE V.

Blood Counts of Apparently Healthy Fowls.

Fowl.	White.	Red.
No. 11	24,000	2,980,000
No. 12	26,300	2,987,000
No. 14	36,000	3,115,000
No. 15	52,000	3,980,000
No. 16	61,000	3,920,000
No. 17	30,000	2,380,000
No. 18	24,000	3,620,000

In the case of No. 8, a marked diminution of the red corpuscles and increase of the white corpuscles are noticeable. A comparison of the counts of fowls A and B with the normal counts would lead to the conclusion that a decrease of red corpuscles had occurred in cases of natural infection.

TABLE VI.

Changes in the Blood Counts of Fowls Inoculated with Cultures of the Fowl Cholera Organism.

Fowl.	White.	Red.	Remarks.	Temperature.
No. 11	24,000	2,980,000	Normal. Injected ·5 c.c. 24-hr. cult. subcutaneous	42·3° C.
No. 11	19,000	3,380,000	23 hours after inoculation. Died 2 hours later	43·3° C.
No. 12	26,300	2,987,000	Normal. Injected ·5 c.c. 24-hr. cult. subcutaneous	42·3° C.
No. 12	27,000	3,500,000	24 hours after inoculation. Died next day.	42·3° C.
No. 13	129,000	3,300,000	Before inoculation. Injected ·015 c.c.*	42·3° C.
No. 13	142,000	3,310,000	24 hours after inoculation.	42·0° C.
No. 13	257,000	3,046,000	Died following day. *Post mortem* showed tuberculosis and cholera	42·4° C.
No. 16	61,000	3,920,000	Normal. Injected ·01 c.c.* subcutaneous	...
No. 16	15,000	1,880,000	36 hours after inoculation. Died night after	...
No. 17	30,000	2,380,000	Normal. Injected ·01 c.c.* subcutaneous	...
No. 17	22,750	1,590,000	30 hours after inoculation	...
No. 17	14,500	1,700,000	48 hours after inoculation	...

The figures for Nos. 11 and 12 reveal no marked change in the relative number of corpuscles during the short course run by the disease in these cases. No. 13 shows a marked leucocytosis in avian tuberculosis, increased by infection with cholera without disturbance of the number of red corpuscles. No other fowl in the list showed

* Culture diluted and figures consequently approximate.

lesions of tuberculosis or other disease upon *post mortem* examination. Nos. 16 and 17 show a distinct decrease of both classes of corpuscles. Fowls 8, A, B, 16, and 17 furnish evidence that a marked diminution of red corpuscles may occur. This fact accounts for the pale appearance of the blood commented upon by some observers.

In all cases Toisson's fluid was used for diluting in the pipette. During the counting there were noted bodies resembling the red corpuscles, but somewhat smaller and, unlike them, were stained blue. They occurred singly sometimes, but more often in clusters. which fact occasioned some embarrassment during the leucocyte counts. They occur in both normal and pathological blood. In mounted specimens of fresh blood they occur in clusters and show a refractive nucleus with sharply defined border, surrounded by protoplasm with a poorly defined border. The protoplasm is deficient in amount as compared with the red corpuscles, and among the clusters apparently free nuclei are observed. With the Wright-Jenner stain the nuclei behave in general like those of leucocytes, but appear larger, while the protoplasm takes on a pale blue colour. The cells quite closely resemble those of the red corpuscles, except that some are more narrow and others smaller.

Moore has mentioned the fact of red corpuscles staining in Toisson's fluid. Under the designation of red corpuscles, he has pictured cells identical in morphology with those just described. The present writer has regarded the bodies in question as atypical red corpuscles, and has ignored them in blood counts. In one specimen of pathological blood in which it was fancied that they were more numerous than in normal blood, they were counted with great difficulty. In this instance 400 squares were gone over, and the conclusion reached that the sample contained 54,000 per cubic millimeter.

Phagocytosis has not been observed in mounted specimens of fresh blood.

Culture media implanted from the liver, spleen, kidneys, and heart blood of fowls and turkeys, yielded cultures of a bacterium possessing the characters of the *Bacterium septicæmiæ hemorrhagicæ* group. A description of the organism follows:—

Morphology.—The individual cells are short, non-motile rods, with rounded ends. They usually occur singly, but few are seen in pairs. Spherical forms are numerous in actively growing cultures. The size varies from ·4 to ·6 μ broad and from 1 to 2 μ long. A bipolar arrangement of the protoplasm is demonstrated when carbol fuchsin and alkaline methylene blue stains are used. The bipolar staining is noticeable frequently in smear preparations from tissues. The presence of a capsule is suggested by an unstained area surrounding each organism when a background of stain is deposited upon the cover glass. The same appearance is noticeable in smear preparations from tissues. The organism retains the stain but faintly when treated after Gram's method.

Biologic Characters.—The organism is aërobic and facultative anaërobic. It grows readily at 37·5° C., and with much less rapidity at room temperature.

Agar.—The colonies on one per cent. agar, after forty-eight hours incubation at 37·5° C., appear as round, smooth, thin, shiny disks, with entire* border and measuring about 2 mm. in diameter. Under a two-thirds objective they appear coarsely granular and show concentric circular markings. They appear smoky brown in colour by directly transmitted light, and gray by reflected light. Colonies beneath the surface are usually lenticular in shape, and the granular appearance is more marked under a two-thirds objective than in the surface colonies. After twenty-four hours the growth on the agar slant culture is flat, smooth, shining, translucent, grayish white by reflected light, and smoky brown by transmitted light, with undulate border. The condensation water becomes decidedly turbid. After the first week of growth the liquid clears somewhat with the deposition of a viscous sediment. No pellicle has been observed on the condensation water.

Glycerine Agar.—Growth upon this medium presents no features distinguishable from that upon agar slant.

Gelatin.—Surface colonies, after about two weeks' growth at room temperature, are round, vitreous masses, with entire border and smooth shiny surface. A large proportion of the colonies are raised, forming a conical mass not exceeding 1 mm. in diameter. Such colonies appear highly refractive by directly transmitted light. Under a two-thirds objective the colonies have a finely granular appearance and show concentric circular markings. Sub-surface colonies are lenticular in shape and granular.

After three days' growth under similar conditions the growth in gelatin stab cultures is noticeable as a mass of closely aggregated colonies near the surface. After about two weeks the surface growth appear as a round, thin gray mass, with contoured surface and undulate border. At the same time the growth along the whole length of the path of the inoculating needle appears as a mass of closely aggregated distinct colonies.

Potato.—Implantations on this medium have not resulted in visible growth.

Alkaline Bouillon.—After forty-eight hours at 37·5° C. the fluid becomes slightly clouded and does not clear up on standing, even after four months. In cultures two or three days old no sediment is deposited, but in older cultures a viscous sediment accumulates. The reaction is alkaline to litmus and markedly so in old cultures. No pellicle is formed, but occasionally a circular bluish band of growth adheres to the tube at the level of the surface of the fluid.

Sugar-free Bouillon.—Growth is similar to that in alkaline bouillon.

* The descriptive terms suggested by Chester and by Kendall are used.

Acid Bouillon.—The growth is similar in appearance to that in alkaline, except that the turbidity is less marked and no accumulations have been noticed at either surface or bottom of liquid. Reaction becomes alkaline in old cultures.

Milk.—No change occurs in this medium during the length of time that it is ordinarily kept under observation.

Fermentation Tubes.—(1.) One per cent. glucose bouillon: The liquid throughout the tube becomes uniformly slightly clouded in twenty-four hours at 37·5° C., and remains so. The reaction becomes acid in two days. No gas is formed. A slight amount of viscous sediment collects.

(2.) One per cent. lactose bouillon: The character of growth is similar to that in glucose. The reaction remains alkaline.

(3.) One per cent. saccharose bouillon: The growth is similar to that of the two preceding. The reaction becomes acid in two days, but eventually becomes alkaline in cultures several weeks old.

Dog Blood Serum.—After twenty-four hours at 37·5° C. the path of the needle is occupied by a smooth, shiny, raised growth of a colour determined by that of the serum. The condensation water is markedly turbid. Six days later the growth, as well as the surface of a pellicle on the condensation water, has a coppery lustre.

Loffler's Blood Serum.—After twenty-four hours' growth at 37·5° C. the path of the needle is marked by a white, raised growth, with shiny, contoured or smooth surface and undulate border. The condensation liquid becomes decidedly turbid. After several days the surface of the growth becomes dull. The liquid is then observed to contain a viscous sediment and to have patches of pellicle floating upon the surface.

Indol.—A positive reaction is obtained in sugar-free bouillon cultures.

Thermal Death-point.—This organism was, in two instances, destroyed in freshly planted tubes of bouillon standing in water at 57° C. for ten minutes. Exposure at 57° C. for the same length of time failed to kill the organism in one instance, and was fatal in another case.

Disinfectants.—Duplicate tests show that a drop of a 24-hour bouillon culture, dried upon a cover glass, is sterilised by exposure to direct sunlight for an hour. A similar experiment in which the organisms were exposed to diffused light in a dark corner indoors indicates that the organisms die in about four days under indoor conditions. 0·25 c.c. of a 24-hour bouillon culture was added to 10 c.c. of a 1:2000 solution of Wyeth's sublimate tablets. A culture implanted after one minute showed growth after incubation, but those made at three, five, and ten minutes were sterile.

Animal Inoculation.—Subcutaneous or instravenous injection of fowls with 1 c.c. of a 24-hour bouillon culture resulted in death in about 15 hours. Doses as small as 0·05 c.c. killed in about three

days. A young rabbit inoculated with 0·5 c.c. in an ear vein was found dead 14 hours later. A guinea pig inoculated with 1 c.c. subcutem was found dead in 14 hours. Another receiving 0·5 c.c. subcutem survived 36 hours. A pigeon swallowing 1 c.c. died in 21 hours, and another receiving 0·12 c.c. subcutem was found dead 14 hours later.

SUMMARY.

Fowl cholera has been identified in California. The results of observation and experiments lead to the conclusion that the disease is introduced into the body through food and probably also water infected with the bacteria, causing the disease. Fowls eat their dead at every opportunity, which practice must be strictly guarded against during an outbreak. Contamination from the infectious droppings is prevented by disinfecting the roosting-houses daily and by feeding from troughs designed to prevent fowls from walking in the feed. The same end is favoured by moving infected colonies to fresh ground. Possible infection through the drinking water is prevented by placing a weak solution of corrosive sublimate in the drinking-water fountains. The prompt slaughter and thorough disposal of all sick hens during an outbreak contribute toward preventing the spead of the disease. The evidence goes to show that fowl cholera is a comparatively easy disease to control; but disinfection must be continued after the death-rate becomes insignificant.

The dissemination of the disease in some cases is undoubtedly due to careless disposal of the dead. The movement of sick fowls is of importance in the same connection.

Observations show that it is possible to take new stock on land where the cholera has existed two weeks before, provided the buildings be moved and disinfected. This is confirmed by experiments in the laboratory, which show that sunlight and disinfectants rapidly destroy the bacteria.

Sell the young roosters as fast as they mature. There is much waste in keeping too many roosters.

The poultry that is having the run of the orchard now is serving well their day and generation.

Pick the geese and ducks regularly; somebody will want the feathers.

If you feed green cut bone see that it is fresh and that it is not from animals that have died of disease.

ROSEWORTHY LAYING COMPETITION.

(By M.P., in the *Garden and Field.*)

The second egg-laying competition held under the auspices of the Royal A. and H. Society, which is being conducted at the Agricultural College, Roseworthy, under the management of Mr. W. R. Day, reached the completion of the first six months on the 15th inst. The occasion was celebrated by a visit of representatives of the Adelaide Press to the college, where they were received and entertained by the principal (Professor Perkins). The professor, together with Mr. Day, accompanied the visitors in their inspection of the pens and very kindly placed all the facts and figures in connection with the competition at their disposal. A pleasant hour was also spent under the professor's guidance in viewing the garden and vineyards, etc., included in the college property, thus enabling them to obtain an insight into the working and management of our State College.

Competitors will be glad to know that the birds were found to be in the pink of condition, and the pens and surroundings generally such as commanded the strongest expressions of approval on the part of the visitors, who recognised the great amount of interest Mr. Day has put into his work, and were able to congratulate him on the fact that, in spite of a decidedly inauspicious beginning, he has brought the birds to a position which is, at all events, creditable, and is very much better than at one time appeared to be at all possible. This result must be very gratifying to Mr. Day, and one can only express the hope that the remaining months of the competition may result in an equal or greater measure of success.

I thought the occasion a good one of obtaining from Mr. Day some record of his observations and the conclusions arrived at during the six months the birds have been under his charge. Mr. Day was, as I have always found him, most willing to furnish any information in his power, and the nature of my questions may be gathered from the following notes, which may be taken as the opinion of the "man at the wheel," and therefore of value to all interested in poultry-keeping, for I give practically the whole of Mr. Day's remarks. After touching on general matters and mentioning the very unfavourable weather during the earlier stages of the competition, which, no doubt, in part accounts for the late start made by many of the birds, Mr. Day went on to say that after the first few weeks it seemed to dawn upon them that they had entered a competition for the production of eggs, so they started in a fairly consistent way, and have continued to help to supply the market in a satisfactory manner, while others, in addition to speculating for some time as to whether they would start or not, have not done anything startling up to date. But, of course, there are still six

months, which may mean a lot, even to a hen. While it is not fair to expect every hen to be a record-breaker in the art of egg-production she is generally expected to make things hum a bit at about this time of the year, although the market value of her production is not at all likely to encourage her at over-exertion. One good result to be shown as a result of the competition will be the superiority of one pen above another of the same class of fowl. What I would like to point out is this, that while one pen, say Minorcas or Leghorns, are doing well, it does not follow that Minorcas or Leghorns are all good.

I think it will also show competitors how very necessary it is to either send pullets from a well-tested laying strain, or prove their own birds as soon as possible before entering. I cannot think a competition should be for the purpose of finding out whether a certain lot of hens can lay or not, but rather to find out how many they can lay as recognised layers, which I think is the desired point. This will assist the industry generally and benefit the breeders of such stock certainly.

The monthly figures show the increase in the monthly totals since the start. This increase has not been very large, but steady all along, and I think the last month will be our best:—

May 15th to 31st, 295; June, 811; July, 1,294; August, 1,737; September, 3,115; October, 3,585. The laying season, continued Mr. Day, can now be considered on the decline, and as a number of the birds are showing a strong inclination to sit, I expect a falling off of eggs for this month. In reply to questions as to broodies, Mr. Day replied that as soon as the birds become broody they are removed from their pens to a pen erected for their especial benefit, and at the present time as many as 23 are to be seen parading around, not taking any especial interest in anything, but helping to the best of their ability to keep the percentage down. I find from six to ten days sufficient length of time, according to the breed, to check their desire to obtain chickens out of the half of a kerosene tin.

FEEDING.

Now, as to the feeding, the programme has been the same all through, and has been as follows:—7 a.m. bran and pollard, mixed with hot water on three mornings, and crushed liver and hot soup on the remaining four mornings, and served as hot as possible, a little salt is added to the liquid while boiling. This feed was much appreciated by the fowls during the cold weather and must go far towards bracing them up after the inactivity during the hours of the night, which are rather long at that time of the year. Midday meal, crushed bones and green feed as follows:—Cabbage, lucerne, rape, kale, cauliflower, and last, but not least, sow or milk thistles, and for the benefit of those who may not know I would like to place on record the fact that I have found the fowls very much enjoy a bunch of thistles, as during the early part of spring they contain a great deal of moisture, and about this time the birds find

good employment picking the seed heads to pieces, and I would place it as a most desirable green food to obtain.

For the evening meal the following grain has been given and varied as much as possible:—Wheat maize, peas, torrified barley, oats, and Cape barley, which is always soaked for a few hours previous to feeding so as to assist digestion, but with the approach of warmer weather we intend to feed more wheat and oats and torrified barley, and not feed maize or peas, which are more suitable for the colder weather. A good supply of shell grit, oyster shell, and quartz grit is always available for the birds, and a small heap of river sand in each yard is much appreciated by them. A supply of charcoal will be placed within their reach from now on. Clean water is placed in a shady spot in each pen every day for drinking purposes.

DEATHS.

I regret very much to have to report the deaths of three of the hens during the period under review, otherwise the health and general appearance of the birds has been excellent. All the houses have been washed inside and out with hot lime, and the birds and nests frequently dusted with insectibane, and everything has been done to insure cleanliness and good health which, after all, is the main feature of the game.

GENERAL NOTES.

You will, I am sure, continued Mr. Day, note with pleasure the general good health of all the birds, and it gives me great pleasure to say there is a decided improvement in appearance in connection with some of the pens since their arrival here.

Your readers will have noticed the long delay that occurred at the starting of the competition, say up to 16 or 17 weeks. This caused much anxiety to some of the owners, and also myself. It can, I think, only be accounted for by the excessively bad state of the weather at the time, combined with fresh surroundings, and perhaps a different method of feeding, but from now on I hope to have plain sailing. Probably a lot of trouble might have been avoided had we started a month or so earlier, which would have given the birds a better chance of settling down before the weather became too bleak and wet.

THE FUTURE.

Now, as to the future, who can predict? I hope for some time to be able to continue to gather hen seed in satisfactory quantities daily, and although I am not expecting any better monthly returns than I have been getting I have hopes that the market value of same will not be much lower than 5½d., for I think that is a blow from which a good many hens would not recover. I hope the results will be considered fairly satisfactory. With continued good health amongst the birds I can see no reason why they should not do fairly well during the next half of their term here, and thus end a very satisfactory effort to further the poultry industry.

FINANCIAL RESULTS.

Coming to the important question of profit and loss, we are informed that the cost of food for the six months totals £15 11s. 6d. This is slightly over 10s. per pen, so that practically all the birds have earned their keep, and a more or less (mostly less) substantial amount over. Ten shillings per pen works out at slightly less than 1d. per head per week, thus confirming the generally accepted belief that with wheat at 3s. it cost 4s. to keep a hen for one year when all food is supplied, as is the case at Roseworthy. Thus we find that, taken all round, the birds show a profit of just over 2s. per head for the six months. The prospects for a much increased profit during the next six months are not very rosy, for the last three months can hardly be expected to be very productive. So we again come down to the bedrock fact of poultry-keeping, *i.e.*, that it only pays to keep the best. Even the record of the "Sunnyhurst" Leghorns, which has been beaten by only one pen in any competition yet held in Australia, when expressed in £ s. d., does not look a fortune-making proposition. Still the fact remains that nearly 1s. per head per month profit is a sum which ought to satisfy the most exacting poultry-keeper.

Return for six months ending November 14, 1904:—

Place.	Breed.	Competitor.	Eggs laid.	Value, less fractions. £ s. d.
1	White Leghorn ...	"Sunnyhurst" ...	750	2 5 7
2	White Leghorn ...	Mrs. Butler	640	1 16 4
3	Silver Wyandotte	W. A. E. Smith ...	598	1 17 11
4	Buff Leghorn ...	C. Foot	560	1 12 9
5	Minorcas	Penglase Bros. ...	528	1 9 0
6	Black Orpingtons...	A. H. Tyler	518	1 6 4
7	Ancona	Dr. H. H. E. Russell ...	481	1 4 7
8	Buff Orpington ...	J. C. Balfour	465	1 6 8
9	Langshan	G. Hassell	459	1 3 9
10	Brown Leghorn ...	H. P. Marshall ...	448	1 1 6
11	Buff Orpington ...	R. Laidlaw	445	1 4 0
12	White Leghorn ...	T. E. Crompton ...	423	1 3 5
13	Buff Leghorn ...	"Sargenfri" Yards ...	406	0 19 5
14	White Wyandotte	W. C. Bennett ...	370	0 19 3
15	White Leghorn ...	A. H. & J. E. Padman	363	0 17 3
16	Black Orpington ...	Chart Co.	363	0 19 1
17	Buff Leghorn ...	T. E. Yelland	363	0 16 7
18	Black Orpington ...	F. J. Wimble	359	0 18 0
19	Minorcas	"Alfalfa" Yards ...	353	0 17 11
20	Silver Wyandottes	T. B. Robson	346	0 16 1
21	Black Hamburgs ...	G. Fulwood	345	0 16 11
22	Brown Leghorn ...	J. Hunter, jun. ...	325	0 15 0
23	Black Spanish ...	J. Kluge	324	0 16 5
24	Silver Campines ...	J. Smith	312	0 15 9
25	Silver Campines ...	J. H. Hobbs	308	0 16 2
26	White Leghorn ...	W. S. & E. T. Dean ...	306	0 13 7
27	Brown Leghorn ...	W. D. Hammatt ...	304	0 13 4
28	Golden Wyandotte	L. H. Muecke	278	0 13 11
29	Golden Wyandotte	H. M. Pugh	265	0 12 2
30	Golden Wyandotte	P. W. Mellor	225	0 9 10
31	Minorcas	J. Bower	167	0 7 4
		Total	12,397	£321 7 5

COMPARISON TABLE.

The following table enables the reader to compare at a glance the totals for the first six months in each of the six competitions. The Dookie totals are wonderful, even taking into consideration the exceptionally favourable conditions which we hear obtain there. The Roseworthy average output of a fraction under 400 per pen is decidedly encouraging:—

Where held, and date.	No. of pens.	Highest total any pen (six months.)	Average total per pen (six months).
Hawkesbury, 1902	38	548	343
Hawkesbury, 1903	70	711	470
Magill	26	503	328
Roseworthy, 1904	31	750	399
Dookie	37	765	581
Hawkesbury	100	505	390

A COMPARISON.

This table gives the three leading pens in each of the six competitions held to date. It will be noticed that the names of Messrs. Ponton (Langshans), Smith (Silver Wyandottes), Howell (Silver Wyandottes) occur twice, which speaks well for the consistency of their strain of birds:—

Hawkesbury, 1st, 1902.

Black Orpingtons (Wild)	548
Silver Wyandotte (Henry)	519
R.C. W. Leghorn (Grantham)	470

Magill, 1903.

Silver Wyandotte (Smith)	503
Golden Wyandotte (Caterer)	484
Silver Wyandotte (Sargenfri)	481

Hawkesbury, 1903.

R.C. Brown Leghorn (Hansel)	711
Silver Wyandotte (Howell)	693
Langshan (Ponton)	647

Dookie, 1904.

White Leghorns (Levens)	765
Langshans (Ponton)	732
Pile Leghorns (Hudson)	718

Hawkesbury, 1904.

Black Orpingtons (Saysbrook)	595
Golden Wyandottes (Peters)	594
Silver Wyandottes (Howell)	574

Roseworthy.

White Leghorn (Sunnyhurst)	750
White Leghorn (Butler)	640
Silver Wyandottes (Smith)	598

DALGETY'S REPORT.

Dalgety & Co., Limited, report in connection with produce sales, at Perth and Fremantle, for month ending 8th December, as follows:—

Wheat.—London market is better at 33s. 3d. per quarter of 480lbs., c.i.f. London. Adelaide is firmer at 3s. 4d. per bushel, at which price much business is passing.

Local Wheat.—New season's wheat is now available in limited quantities for prompt delivery, but farmers are offering large parcels for delivery in January. We sold a considerable quantity of wheat for forward delivery. Much business has been transacted at from 3s. 1d. to 3s. 2d. per bushel, f.o.r. country stations; however, at the moment there is a lull in the buying enquiry, millers only operating carefully. We may shortly be again on the market for wheat to fill export orders. In addition to this we are shipping wheat to the United Kingdom for sale on consignment, and intending shippers are requested to consign export wheat to Dalgety's Siding, Fremantle, at the same time advising us to that effect. We are prepared to receive the wheat, ship and sell it in London, and remit proceeds to W.A. (free of exchange) for a commission of 2½ per cent. This commission includes the London Broker's commission, and having our own London house, we are in a splendid position to successfully export wheat, having been engaged in the grain trade for so many years.

Wheat.—Fair quantities of wheat are coming forward to Perth and Fremantle at from 3s. 5d. to 3s. 6d. per bushel for milling samples.

Export.—The wheat (2,270 bags) shipped by us per "Essex" to Liverpool, cleared, after paying all expenses, 3s. 2½d. per bushel at rails, Fremantle; therefore, on a London market of 32s. 6d. per quarter the export partly, without allowing for gain in weight, is 3s. 2¼d. per bushel on trucks at Fremantle. We will advance 75 per cent. of value of wheat received for shipment.

Oats.—No locals offering yet, and we are advising farmers not to consign to Perth or Fremantle until after Christmas. It is almost certain that low prices will be ruling for Algerians during the next few weeks. Stocks of Algerians at Fremantle are fairly heavy. At the present time imported Algerians are being freely offered. The demand from all consuming districts is good, and orders for Algerians are being freely sent to Fremantle merchants from all quarters, heavy clearances having been reported during the past week. Melbourne market is easier at 1s. 1d. to 1s. 3d per bushel for good samples. New Zealand market is firm at recent quotations.

Straw.—We have little business to report beyond the sale of a few trucks of good long straw at from £2 to £2 5s. per ton at Perth; however, it is likely that consignments to market will increase very shortly, in which case prices will ease. Farmers should therefore write us before consigning.

Hay.—We have placed 500 tons of pressed hay for the Nor'-West stock trade, at various prices. We can still place 200 tons, and sellers may do well to communicate with us.

Potatoes.—Local potatoes are still in excessive supply at Perth and Fremantle, the markets being quite against sellers. New potatoes are selling in Perth at £6 15s. to £7 10s. and £8 per ton. Our Bunbury office reports an almost entire cessation of direct orders from the goldfields, as Kalgoorlie merchants have been well supplied with high-priced potatoes. Potatoes are also coming forward to Kalgoorlie for sale on consignment, and our Kalgoorlie branch during the past week sold prime Bunbury potatoes

at £7 10s. per ton, f.o.r. Kalgoorlie, which can hardly be a satisfactory price. It is expected that this position will improve in about a fortnight's time.

Chaff.—Supplies to Perth and Fremantle for many days were very heavy, thus causing the greatest glut we have yet experienced. Prices promptly declined to bedrock rates, speculators immediately seizing the opportunity to buy, with the object of storing for a better market. The position of values now has no bearing on possible future course of prices later in 1905, as this first flush was probably the result of many growers rushing on to the market to obtain ready cash to meet machinery and other bills now falling due. In fact, judging by numerous private advices, we think that after the first flush of the season is over, prime green wheaten chaff will probably realise good prices, as this year's crop of prime hay, it is expected, will not be as heavy as usual. This position may not affect second-class hay. We, not being too satisfied in all recent instances to sell chaff at market rates, have stored on farmers' account about 200 tons. We do not store for preference, but merely when we do not feel justified in selling on a dull market. We will make advances on chaff stored in our own stores. The recent glut has had a reactionary effect in reducing supplies coming forward, farmers not being satisfied to sell at recent rates, which have since improved fully 5s. per ton.

The market is now improving, at the following prices:—

- Prime green wheaten (sound), good demand, £30 1s. to £3 15s. per ton.
- Fair average quality wheaten (green), good demand, £3 2s. 6d. to £3 15s. per ton.
- Medium wheaten, from £2 15s. to £3 per ton.
- Prime oaten (fair enquiry). None forward.
- Good sound oaten (none forward), nominal value £3 5s.; £3 12s. per ton.
- Inferior chaff from £2 10s. per ton upwards.

The markets should improve towards Christmas.

Northam market is now easy at from £3 5s. to £3 10s. per ton. We append the following figures. The stocks on spot given below are approximate, this information being difficult to collect:—Total arrivals to Perth and Fremantle during November amounted to 2,552 tons. (In our report of November 4 we erroneously stated that October arrivals were 2,056 tons. This should have been 1,804 tons). It will thus be seen that the November glut was caused through an increase in arrivals of 678 tons. Perth and Fremantle during November consumed and distributed 1,815 tons, whilst stocks at both centres on November 30, 1904, totalled 1,300 tons, most of which has passed from agents' to merchants' hands.

KALGOORLIE.

Chaff.—Since our last report consignments have been, on the whole, much too heavy for requirements, the siding being in a state of continual glut. There was a heavy yarding on Tuesday, but daily arrivals gradually decreased, until to-day's were the lightest of the week. Although the siding is glutted, recent heavy arrivals have resulted in an accumulation of stocks in merchants' hands, and, should farmers refrain from again rushing the market, we confidently expect to see a better time and increasing values. Prices at the present time are irregular, and may be put down as follow:—Prime green wheaten, fair sales at an average price of £4 5s. per ton; good quality wheaten, up to £3 15s. and £3 17s. 6d. per ton; medium wheaten. £3 10s. per ton. Just as this report goes to Press our Kalgoorlie branch has wired:—"Report better outlook chaff; bare arrivals; anticipate better demand should this continue."

STOCK AND STATION REPORT.

We held our usual monthly sale at Beverley on Thursday, 24th ult., when there was a full yarding of stock, a good attendance of buyers, and keen competition for all sheep offered. Lambs—180 at 13s., 150 at 11s., 170 at 11s. 1d., and a few smaller lots at from 11s. to 12s. 6d. Ewes—Store ewes, forward condition, to 18s.; store ewes, fair condition, 15s. 3d. to 17s.; a line of ewes with lambs at foot, 20s. 3d. Cattle—A few cows yarded. Springers, £9 to £10 10s.; fat steers, £7 5s. Pigs—No pigs forward. Horses—The horse market was somewhat dull. A few heavy draughts sold at £47 10s.; medium, from £23 10s. to £30; light horses, £6 to £12. Ducks.—Ducks sold at 6s. per pair.

MINGENEW.

We held a special stock sale at Mingenew on Wednesday last, when we sold by auction 1,400 fat wethers and 600 fat ewes from the Murchison, at an average price of 15s. 11d. per head. There was a large and representative attendance of buyers, hence the good price realised.

SKIN AND HIDE REPORT.

Wool.—We submitted the largest offering for the season at to-day's sale, the qualities ranging from medium to good wools, and a strong demand was experienced for all descriptions. Merino fleece, good quality, to 8¾d.; medium quality, 7¾d. to 8½d., inferior, 6¾d, to 7½d; lambs, 5½d. to 6¾d.; bellies and pieces, 3½d. to 5d.; locks, 1d. to 2d.

Sheepskins.—These were in good supply and satisfactory clearance was made of all offerings. Full-woolled skins were firm at late values, while prices for all of shorter growth show a rise of ¼d. per lb. Super. merino, full wool, to 7½d.; good merino, three-quarter to full wool, 7d. to 7¼d.; medium merino, three-quarter to full wool, 6¼d. to 6¾d.; good merino, quarter to half wool, 6d. to 6½d., medium merino, quarter to half wool, 5¼d. to 6d., fine crossbred, three-quarter to full wool, 6¾d. to 7½d.; fine crossbred, half to three-quarter wool, 5¾d. to 6½d.; medium, three-quarter to full wool, 6¼d. to 5½d.: coarse crossbred, 6d. to 6¼d.; pelts, 4d. to 5d.; lambs, 5d. to 5¾d. In all cases were pelts of above are sun-dried, weevil-eaten, torn, or perished, prices are from 1d. to 2d, below quotations.

Hides.—Only a small offering was submitted, and values received admit of no alteration from those lately quoted. A strong demand exists for all descriptions. Heavy, special, to 4¾d.; heavy, 4¼d. to 4½d; medium and light, 4¼d. to 4½d.; medium and light, dirty conditions, 4d. to 4¼d.; dry, 4d. to 4¾d.; damaged and cut, 3¼d. to 3¾d.; ticky, 3¾d. to 4d.

Tallow.—There is no improvement to quote in this market, and values are unchanged. Good mixed in (casks), to 19s. 6d.; medium, 18s. to 18s. 6d.; inferior, 17s. to 18s.; tins and oddments, 16s. to 18s.

Kangaroo Skins.—An average offering elicited good competition, but with no material alteration in values. ¾lb. to 1lb. average, 2s. 3d. to 2s. 6d. (blue skins), 2s. to 2s. 5d. (red skins); 1lb. to 1½lb. average, 2s. to 2s. 6d. (blue), 1s. 9d. to 2s. 1d. (red); 1½lb. to 2lb. average, 1s. 9d. to 1s. 11s. (blue), 1s. 7d. to 1s. 9d. (red); extra heavy and very light weights, 1s. 2d. to 1s. 6d. (blue), 1s. to 1s. 4d. (red); damaged skins, 1s. to 1s. 10d. (blue), 1s. to 1s. 8d. (red); Euro skins, 1s. 2d. to 1s. 7d.; brush kangaroo, 1s. to 1s. 4d.

Horns, Hair, etc.—In the absence of supplies we quote these nominally. Horns, large and fresh, 36s. to 42s. per 100; small and fresh, 14s. per 100; stale and perished, 5s. to 10s. per 100; very small, 3s. per 100. Rough bones, 3s. 6d. per 100. Horse hair, 1s. per lb.; cow hair, 5½d. per lb.

FARM NOTES.

By F. L. FAULKNER.

The few weeks just passed have proved very forcible in the ripening of all farm crops. This spell of hot weather, setting in as it did so suddenly after an exceptionally wet October, is causing all late wheats that were sown late to be forced to maturity very quickly. All these crops are very short, and although the resulting hay crops are very light, they are, generally speaking, heading well and promising very fair grain crops. On the other hand, one or two instances have come under my notice of early maturing wheats that were sown early giving very unsatisfactory promise, being very badly filled in the ear, and with a long, weak, rotten straw. The reason for this is no doubt accounted for by the excessive wet and cold weather in October, at the time when these early crops were making most of their growth and flowering. As an instance of this latter case we have a crop at the Experimental Farm, at Narrogin, of 20 acres of "Alpha" (a very early maturing, and a good wheat). It was sown early in April, and on 1st October promised at least a 20-bushel crop, and was just on flowering. With the advent of October came a spell of very wet cold weather, resulting in a poor fertilisation of the flowers and badly-filled heads (many of them being absolute dummies). The straw, also, was weak and rotten. On 22nd November last the crop was cut for threshing, and promises now about 10 bushels to the acre. When cut, much of the crop was over-ripe and lying right on the ground, while a good deal of it was still quite green.

It must be concluded from this that it is a mistake to sow early maturing wheats too early, in this district at any rate, and at the same time it is a decided mistake to sow late and slow maturing wheats late. The difficulty may be got over, and I think the way to get the best results, taking one season with another, is to sow the late wheats at the beginning and finish the season with the more quickly maturing ones.

SELECTING SEED WHEATS.

The season is now ripe for farmers to look about for what new seed they require; and there is no doubt that judicious changing of seed is of great importance in grain crops.

Farmers would also be wise to see that at least the major part of their crop is of rust-resisting varieties.

There is absolutely nothing to prevent Western Australia being swept, like the Eastern States have been on many occasions, both

recently and in years past, with this terrible scourge. The argument for growing only rust-resisting wheats is all the more forcible when it is pointed out that there are many of these wheats not only practically proof against the effects of rust, but they are big yielders, hardy, good to harvest, and give wheat of good milling quality. Another very important factor in selecting seed wheat, and one that requires to be noticed as the crop is standing, is to obtain it from as good a parent crop as possible. As with stock, feeding is half the breeding, so it is with grain; and all else being equal, seed from a well-matured and good crop will give a better crop than seed selected from a short, poor, uneven one. This is apart altogether from the grading and selecting of individual grains.

HAY-MAKING.

The time to cut hay is a question much debated, and on which there is much diversity of opinion. It is found by agricultural chemists that a wheat crop gains very little nutriment from the soil a week after it has bloomed, and that after that period the process is chiefly one of transference of the nitrogenous and starchy matters from the flag and straw to the grain.

The following is a table, by Warrington, showing the digestibility of hay cut at different stages, when fed to sheep:—

Date of Cutting.	Amount digested for 100 of each supplied.				
	Total organic matter.	Nitrogenous matter.	Fat.	Soluble Carbolydictis	Fibre.
May 14 ...	75	73	65	75	79
June 9 ...	64	72	51	64	65
June 26 ...	57	55	43	55	64

The above table gives the argument decidedly in favour of green cutting, and many farmers do cut their hay when in bloom or shortly after. However, the experiment was no doubt carried on with meadow or grass hay containing a large proportion of trefoil and clover, which undoubtedly is best cut at the flowering stage. For purely wheaten hay, and particularly for oaten hay, green cutting is not so good as the above figures would appear to indicate. In practice not only does the green-cut hay get very light and lose much in the drying, but in many cases (and particularly in the case of oaten hay cut green) the hay and chaff is not relished by stock, and even in some instances they will almost starve before eating it. To the taste this hay will have a slightly bitter taste, and the stock, if made to subsist on it, will scour, show symptoms of debility almost as from a form of slow poisoning. The most favourable time to cut hay is no doubt when it is in what is known as "the dough stage," *i.e.*, when the grain is well and fully formed, but still soft like

dough. When cut at this stage it is possible to get the grain in the hay within a few degrees of good marketable wheat, and at the same time if it is well harvested a colour almost as good as any hay can be obtained. For the market, of course, colour is a great criterion for price, but for home consumption there is little doubt that too much colour should not be sacrificed for grain.

STOOKING.—In the Australian States hay should be stooked in fairly large stooks immediately behind the binder, preventing bleaching, and preserving the aroma and digestable quality of the hay. Put just enough sheaves in a stook to make it a good, tight, conical shape, as large as possible, but not so large as to be flat on top, or else, in the event of a heavy rain, they will all require opening out. Well-stooked hay will stand a long period of dry weather and a deal of rain, and take little harm except for the outside bleaching; therefore, pay well to have it well stooked; but if if it has to stand in the field for any length of time, do not have it badly stooked at any price.

Cart hay as soon as ever it will not ferment in the stack, and do not waste any time when once the stacks are started. For sheaved hay there is no doubt that stacks with round ends are more quickly and easily built than one with square corners. In the building the stack should always be kept as full as possible in the centre, and as the eaves are approached particularly so. In building this way the sheaves will have a downward inclination at the outer extremities, and if the roof is put on in this manner (in the ordinary course of events) the hay will take little harm from rain until after harvest.

For thatching stacks it is a good plan to cut the necessary straw with the binder behind the stripper. A good man, with straw thus obtained, should easily cover a hundred ton stack in a day and a-half.

The idea of having galvanised roofs for the stacks is a good one for the home stack, but when cutting large quantities it becomes expensive and often means a large amount of extra hauling. When building a stack in the open it can be put in the corner of the field nearest the chaff mill, or in the most convenient position, and a few panels of fence put round it very quickly.

FEEDING HAY TO HORSES.

With the advent of the binder in the Australian States feeding of rack or long hay to horses has become less and less common, and at the present time very little long hay is fed, even to farm horses. This is a matter worthy of consideration, and farmers will find that horses fed on at least one feed of long hay every day—preferably for supper—will thrive better and require the services of the vetenary dentist less often than horses fed continuously on short chaff. The main reason for the teeth keeping better is that when fed only on chaff the process of mastication does

not necessitate such an exaggerated, or correctly thorough, motion of the lower jaw as does the mastication of long hay, the result being an elongation of the outer side of the molars on one jaw, which elongation subsequently protrudes and irritates the gum on the opposite jaw. This is, in most cases, the cause of slobbering and the rolling of the food often found in middle-aged horses.

In any case good hay is more economical when fed long or when fed as long cut chaff than short cut, as the horses bolt less of it and masticate it better.

STRAW AS A FODDER.

This often much despised but very useful article is deserving of much more attention than it receives at present in the hands of the average farmer. Of course there is always a good deal of coarse rank wheaten straw that is of very little value from a point of view of feeding. But short, soft, flaggy straw, and especially oaten, or English barley straw, is a good change, and relished by most horses.

GARDEN NOTES FOR JANUARY.

By PERCY G. WICKEN.

At this time of the year the vegetable garden does not as a rule appear at its best, unless the grower is in a position to obtain a supply of water suitable for irrigation, or is favoured by having a moist place suitable for vegetable growing. The shortage of supplies in the garden is, however, compensated for to a great extent by the supplies of fruit, grapes, tomatoes, etc., which should be available. Also pumpkins, squashes, sweet potatoes, water melons, and such kinds of summer produce should now be at their best. The most important work that can be done is to keep the surface well cultivated, and by this means retain as much moisture as possible for the use of the plants, and also to apply a mulching of stable manure or other suitable substance around such plants as tomatoes, and also round the trees. This helps to keep the soil moist around the roots by preventing the evaporation, and the mulching can afterwards be dug into the ground and will act as a fertiliser. All weeds should be cut down as soon as they appear, and on no account allowed to seed. One weed plant, such as a dock or other common weed, is quite capable of producing 1,000 to 1,500 similar plants next season, if allowed to seed freely. All dead plants and vegetables, as soon as they are past their best, and if not required for seed, should be gathered into heaps and either burnt or rotted down to be dug in as manure later on.

BEANS (French).—This is a plant that will stand a considerable amount of heat, and is therefore one of the best garden plants for the summer. The Butter bean, a variety of French bean, is one of the best to grow. The dwarf varieties will, as a rule, give better results than the climbing varieties during the summer weather.

BEANS (Madagascar).—Are hardy, prolific, and splendid climbers, answering both for shade and food, and although strong in flavour are acceptable as food when vegetables are not too plentiful.

BEANS (Lima).—If the soil is sufficiently moist a further supply of this bean can be planted, the earlier sown ones should now be ready for use. They are one of the best vegetables obtainable, and should be extensively cultivated.

BEET (Silver).—This plant grows well in the hot dry weather. Keep on using the outside leaves, and fresh ones keep growing from the centre.

CABBAGE.—Sow a little seed, if you have moist ground for future use.

CELERY.—Earth up any plants that you may have growing, so as to cause them to bleach.

CHOKOS.—Should require tying up to a trellis; they grow rapidly and fruit well. Boil the fruits for table the same as vegetable marrows.

CUCUMBERS.—Are now plentiful; in moist localities or where water is available, a little more seed may be sown.

EGG PLANT.—Any young plants can be planted out from seed bed, but will require shading.

MAIZE.—Sweet or edible maize for table use may still be sown in the Southern districts. Plant in rows about 30 inches apart and one foot in the rows, keep the soil between the rows well stirred. It is a quick-growing plant.

MELONS.—Should now be plentiful. It is a good plan to pick out the best that you require for seed and mark them, so that they are not used. Only well-grown ones, true to name, should be kept for seed.

PUMPKINS AND SQUASHES.—In cooler parts, a little seed of the quick-growing varieties, marrows and bush squashes may be sown. Others sown earlier will be fit for market. If stored in a dry, well ventilated place, they will keep for a long period.

SWEET POTATOES should be hilled up and the soil kept well worked between the rows. After the vines begin to run, cultivation can only be carried out by a special cultivator made for the purpose, which lifts the vines.

TOMATOES are now plentiful and cheap. All diseased fruit should be pulled off the vines and burnt or otherwise destroyed, and not allowed to decay round the plants, as the germs soon spread to the other plants and the whole area becomes diseased. Fungus diseases can only be kept in check by preventive measures and destroying the infected parts. They should be well sprayed with Bordeaux Mixture before fruiting.

FARM.—The hay harvest and the bulk of the wheat harvest will now be over. The hay should be carted and stacked, and those who do not intend to chaff it at once should thatch the top of the stack to protect the hay from the weather, and also plough a fire-break round the stack to check any bush fires that may occur. As the harvesting machinery is finished with it should be brought into the sheds and taken to pieces, cleaned, and oiled before being put away for next season. More machinery is spoilt by exposure, dirt, and rust than by actual work. Those who strip or thresh the wheat by machinery will find it pay them to grade the wheat before marketing and take out the shrivelled and cracked grain. This will increase the price obtained for the wheat, and the cracked grain can be used for the pigs, which ought to be kept on every farm as a means of turning all bulky and damaged products into a more concentrated and more saleable form, viz., pork or bacon. Do not burn the straw; keep it for the winter, it will come in for both food for the dry cattle as well as for bedding, and can by this means be converted into a useful manure.

Keep a look out for bot-flies. The fly lays its eggs on the hairs of the horse, generally on the jaws and shoulders; the animal licks them off and swallows them. If the horses are well groomed the eggs get brushed off, but if not a good preventive is to rub the jaw and shoulder with carbolised oil, or wash them with carbolic soap or some other disinfectant that is objectionable to the fly and will not hurt the horse. If the eggs are swallowed the grub hatches out in the stomach of the horse and feeds on the juices in the intestines, and often causes the loss of the animal.

The poultryman who is continuously changing breeds never succeeds.

Do not adopt every bill of fare you hear of. If yours is producing good results stick to it.

An excellent wash for swelled head is quinine dissolved in water.

Irregular feeding is apt to cause a derangement of the digestive organs.

THE CLIMATE OF WESTERN AUSTRALIA DURING NOVEMBER, 1904.

The condition of the atmosphere has now settled down into a distinctly summer type, with low pressure inland and high off the South-West and South coast, varied by an occasional "low" passing along the Southern Ocean, and bringing a cool change to the South-West and South.

The mean barometers for the month are somewhat higher than the averages for previous years.

The mean daily maximum temperatures are slightly above the normal, especially over the central Goldfields; and the night temperatures slightly below, except on the fields.

The rainfall over the Kimberley was considerably below the average, very few stations registering over half-an-inch. Wyndham recorded 30 points, against an average of 253. Very little rain, and at the majority of places none, fell over the North-West, Murchison, and Coolgardie fields. In the South-West and South the fall was about an average, occasionally above in Southern portions.

The most noticeable features of the month were the cold, wintry weather experienced South of the tropics in the beginning, the night temperatures being the lowest on record for November; and the distinctly summer type, warm to hot and very disagreeable, which set in on the 11th and continued for a few days. Following this was a cool change in the South-West and South, which brought showers on the 18th and 19th, high temperatures however still prevailing inland and in the North. The month closed unpleasantly warm and hot, except on the South coast, where it was moderately cool.

The Climate of Western Australia during November, 1904.

	Locality.	Barometer (corrected and reduced to sea-level). Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. November, 1904. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	29·875	29·848	30·037	29·733	98·5	81·2	89·8	105·0	72·6	98·5	80·8	111·6	69·2	30	2	3024
	Derby ...	29·886	29·856	30·025	29·745	98·3	76·6	87·4	106·6	71·0	98·4	77·0	112·5	68·8	26	3	3220
	Broome ...	29·896	29·862	30·034	29·757	92·5	74·8	83·6	109·0	67·8	93·1	76·2	111·0	67·8	2	1	2384
	Condon ...	29·889	29·866	30·092	29·687	94·2	69·0	81·6	110·0	49·2	94·6	68·6	112·8	59·0	13	1	662
	Cossack ...	29·902	29·870	30·143	29·674	98·7	71·7	85·2	112·0	57·8	97·7	71·3	111·7	62·4	Nil	...	1323
	Onslow ...	29·936	29·890	30·198	29·766	94·6	65·0	79·8	107·0	50·0	93·8	65·4	110·0	52·5	3	1	1531
	Carnarvon ...	30·122	29·959	30·290	29·886	82·7	63·8	73·2	109·5	50·6	81·9	65·2	109·0	52·2	Nil	...	1094
	Hamelin Pool ...	29·995	29·938	30·300	29·810	92·0	60·0	78·0	108·0	53·0	89·4	60·2	109·0	46·6	Nil	...	1059
	Geraldton ...	30·073	30·005	30·321	29·830	76·2	57·5	66·8	104·0	47·8	77·0	57·7	102·5	45·0	29	4	1496
INLAND:	Hall's Creek ...	29·912	29·866	30·113	29·731	98·9	71·7	85·3	107·7	56·4	101·2	75·0	109·4	59·8	73	1	1540
	Marble Bar ...	...	...	...	...	105·9	74·2	90·0	113·0	59·8	...	...	...	...	5	2	1114
	Nullagine ...	29·876	29·822	30·091	29·609	101·7	68·7	85·2	109·0	52·0	101·9	70·0	111·8	56·0	Nil	...	832
	Peak Hill ...	29·910	29·853	30·150	29·630	95·0	68·0	81·5	105·0	46·0	94·0	67·2	106·5	52·5	6	1	639
	Wiluna ...	29·902	...	30·194	29·554	94·1	64·0	77·6	103·6	38·5	...	...	...	...	10	1	1015
	Cue ...	29·963	29·898	30·296	29·697	94·9	63·1	79·0	105·0	44·2	93·2	63·0	108·2	48·0	10	2	1276
	Yalgoo ...	29·984	29·922	30·320	29·690	92·6	59·3	76·0	104·0	43·1	90·8	59·5	107·7	47·3	13	2	855
	Lawlers ...	29·953	29·894	30·256	29·596	92·2	63·8	78·0	104·1	41·0	90·7	63·6	105·4	45·5	1	1	1012
	Laverton ...	29·960	29·924	30·283	29·561	88·0	63·2	75·6	105·5	42·5	90·3	62·7	103·3	50·0	6	1	1710
	Menzies ...	29·990	29·920	30·325	29·606	90·3	61·3	75·8	103·0	39·1	88·6	62·0	105·6	47·0	Nil	...	913
	Kanowna ...	...	...	...	...	86·0	55·6	70·8	102·0	40·0	...	...	...	...	Nil	...	909
	Kalgoorlie ...	30·012	29·944	30·345	29·570	88·8	57·9	73·4	102·5	40·2	86·8	58·3	107·1	47·2	7	1	1044
	Coolgardie ...	29·986	29·995	30·254	29·521	87·4	56·1	71·8	100·6	40·0	84·6	57·3	106·1	40·2	75	2	1116
	Southern Cross	30·000	29·938	30·341	29·401	89·5	51·2	71·8	105·0	37·8	87·2	55·4	108·5	33·2	[illegible]	3	1557
	Kellerberrin ...	...	...	...	...	...		...									
	Northam ...	...	...	...	...	79·0	52·2	65·8	103·2	38·0					[illegible]	1	1275
	York ...	30·057	29·964	30·315	29·787	80·0	51·7	67·8	104·0	38·0	84·[illegible]	52·2	110·2	[illegible]	[illegible]	[illegible]	[illegible]
	Guildford ...	...	...	...	...	79·6	54·7	67·6	102·[illegible]	40·0			...		5[illegible]	1	[illegible]

* Averages for three years only.

The Climate of Western Australia during November, 1904—*continued.*

Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.		
					November, 1904.					* Average for previous Years.						
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Wet Days.	Total Points since Jan. 1.
South-West and South Coast:																
Perth Gardens ...	30·082	30·024	30·330	29·814	76·9	59·1	68·0	99·5	44·5	78·8	57·0	103·0	44·0	57	4	3437
Perth Observatory	30·093	30·026	30·344	29·795	75·6	56·5	66·0	99·8	41·9	74·9	56·3	100·9	45·7	61	4	3402
Fremantle ...	30·114	30·027	30·338	29·797	72·5	57·9	65·2	96·0	42·5	71·9	58·1	96·2	48·8	73	5	3048
Rottnest ...	30·083	30·005	30·312	29·789	71·6	59·5	65·6	96·2	48·4	71·0	59·1	93·0	49·6	40	4	2545
Mandurah ...	...	...	...	...	76·6	54·1	65·4	98·0	36·5	...	...	...	...	74	3	3566
Wandering ...	...	...	...	...	75·2	45·3	60·2	100·0	36·6	...	...	...	...	91	5	3038
Narrogin ...	...	...	...	...	77·8	46·3	62·0	96·5	35·0	...	...	...	...	31	4	2978
Collie	...	...	...	...	77·8	47·4	62·6	97·8	35·5	...	...	...	...	68	6	3295
Donnybrook ...	...	...	...	...	76·4	49·1	62·8	96·9	37·9	...	...	...	...	128	4	3408
Bunbury ...	30·122	30·038	30·314	29·782	75·0	52·9	64·0	97·0	39·0	73·1	52·8	92·5	42·7	60	4	3325
Busselton ...	...	...	...	...	75·2	50·0	62·6	94·0	39·0	...	...	...	...	92	6	2890
Cape Naturaliste	30·106	...	30·317	29·753	68·7	54·6	61·6	89·5	38·5	...	...	...	...	93	5	2867
Bridgetown ...	...	...	...	...	76·1	46·1	61·1	96·0	35·0	...	...	...	...	105	6	2961
Karridale ...	30·100	30·044	30·230	29·690	69·0	52·0	60·5	86·0	39·0	70·0	52·1	95·0	38·0	116	5	4100
Cape Leeuwin ...	30·095	30·012	30·300	29·540	68·4	57·5	63·0	78·0	44·0	68·1	57·6	88·4	49·0	95	9	3371
Katanning ...	30·072	30·002	30·359	29·724	79·7	49·5	64·6	98·1	38·0	77·8	49·3	106·0	37·0	14	2	1930
Mt. Barker ...	...	...	...	...	72·2	...	...	92·8	...	...	...	...	...	159	9	...
Albany	30·108	30·024	30·415	29·654	69·2	51·2	60·2	87·8	40·8	68·7	52·5	93·5	40·6	165	10	4279
Breaksea... ...	30·085	30·028	30·300	29·560	64·7	54·8	59·8	80·0	34·5	65·4	54·9	88·0	43·2	134	14	3301
Esperance ...	30·068	30·020	30·552	29·648	73·2	52·7	63·0	96·8	42·0	73·3	54·7	105·0	39·2	157	5	3156
Balladonia ...	30·060	...	30·442	29·522	84·9	50·2	67·6	105·0	43·2	...	...	...	...	6	1	1040
Eyre	30·082	30·021	30·427	29·520	75·0	53·0	64·0	103·4	39·0	73·8	54·8	108·1	34·5	34	2	1325
INTER-STATE.																
Perth	30·093	30·026	30·344	29·795	75·6	56·5	66·0	99·8	41·9	78·8	57·0	103·0	44·0	61	4	3402
Adelaide	30·034	30·003	30·415	29·376	76·9	53·5	65·2	99·5	44·9	79·0	55·4	113·5	40·9	65	7	2202
Melbourne	...	29·875	...	...	...	...	...	...	...	71·3	50·9	105·7	36·5	...	...	...
Sydney	29·960	30·980	30·240	29·550	78·0	62·0	70·0	93·0	54·0	74·2	59·6	102·7	46·2	46	...	4506
Cocos Island ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Averages for three years only.

The Observatory, Perth, December, 1904.

W. E. COOKE, Government Astronomer.

RAINFALL for October, 1904 (completed as far as possible), and for November, 1904 (principally from Telegraphic Reports).

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
East Kimberley:				
Wyndham	77	4	30	2
6-Mile	99	2	...	...
Carlton	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	10	1	...	...
Turkey Creek ...	93	3	35	2
Hall's Creek ...	23	3	73	4
Nicholson Plains	...	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	...	...	...	...
Beagle Bay ...	113	2	...	...
Pt. Torment ...	22	...	...	...
Derby	12	1	26	3
Yeeda	...	...	...	...
Liveringa ...	..	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	47	5	77	7
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	26	1	2	1
Roebuck Downs	20	2	...	...
Thangoo	...	...	...	...
La Grange Bay...	Nil	...	2	1

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
North-West:				
Wallal	Nil	...	Nil	...
Condon	6	1	13	1
Pardoo	8	1	...	...
DeGrey River ...	Nil	...	...	...
Port Hedland ...	3	1	Nil	...
Boodarie ...	Nil	...	...	...
Warralong ...	Nil	...	Nil	...
Muccan	3	1	...	...
Ettrick	12	1	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Station Peak ...	...	...	...	...
Coongon	...	...	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	Nil	...	22	2
Marble Bar ...	Nil	...	5	2
Warrawoona ...	Nil	...	Nil	...
Corunna Downs...	Nil	...	...	...
Nullagine ...	Nil	...	Nil	...
Mt. Edgar ...	Nil	...	...	...
Kerdiadary ...	Nil	...	...	...
Roy Hill	12	1	...	...
Middle Creek ...	...	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	Nil	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	Nil	...	...	...
Tambrey ...	Nil	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	Nil	...	27	2
Cooyapooya ...	...	...	...	...
Woodbrooke ...	Nil	...	...	...

RAINFALL—*continued.*

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
NORTH-WEST—*cont.*				
Croydon	Nil	...	...	...
Balla Balla ...	...	...	...	...
Roebourne ...	Nil	...	Nil	...
Cossack	Nil	...	Nil	.
Fortescue ...	Nil	...	Nil	..
Mardie	...	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	Nil	...	...	...
Chinginarra ...	...	...	...	...
Onslow	1	1	3	1
Peedamullah ...	Nil	...	...	...
Red Hill	Nil	...	...	...
Mt. Mortimer ...	Nil	...	...	...
Peake Station ...	Nil	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	Nil	...	...	...
Point Cloates ...	...	...	...	...
GASCOYNE:				
Winning Pool ...	Nil	...	Nil	...
Coordalia ...	...	...	...	...
Towara	Nil	...	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	...	...	...	...
Yanyeareddy ...	Nil	...	...	...
Williambury ...	Nil	...	...	...
Booloogooroo ...	...	...	...	...
Wandagee ...	...	...	...	...
Minilya	...	...	...	...
Bernier Island ...	...	...	...	...
Boolathana ...	...	...	...	...
Carnarvon ...	2	2	Nil	...
Brick House ...	Nil	...	...	...
Doorawarra ...	...	...	...	...
Bintholya ...	...	...	...	...
Mungarra ...	...	...	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	...	...	...	...
Upper Clifton Downs	...	...	...	...

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
GASCOYNE—*contd.*				
Dirk Hartog Island	6	1	..	...
Sharks Bay ...	Nil	...	...	...
Kararang ...	...	...	...	...
Meedo	14	2	...	...
Tamala	...	...	...	...
Wooramel ...	13	1	Nil	...
Hamelin Pool ...	3	2	Nil	...
Byro	...	...	...	...
Yarra Yarra ...	Nil	...	...	...
Berringarra ...	9	1	57	2
Mt. Gould ...	Nil	...	...	...
Moorarie ...	13	2	...	...
Wandarie ...	Nil	...	...	...
Peak Hill ...	15	2	6	1
Horseshoe ...	8	2	...	...
Mt. Fraser ...	2	1	...	...
Abbotts	35	1	...	...
Belele	...	...	...	...
Mileura	15	1	...	...
Milly Milly ...	33	1	Nil	...
Manfred ...	7	2	Nil	...
New Forest ...	21	1	...	...
Woogorong ...	Nil	...	71	1
Boolardy ...	20	1	Nil	...
Twin Peaks ...	...	...	...	...
Billabalong ...	Nil	...	Nil	...
Wooleane ...	Nil	...	47	1
Murgoo	6	1	34	2
Yallalonga ...	...	...	...	...
Meka	10	1	Nil	...
Mt. Wittenoom ...	11	1	...	...
Nannine	35	1	Nil	...
Star of the East ...	26	1	Nil	...
Annean	Nil	...	13	2
Coodardy ...	Nil	...	Nil	...
Cue	18	2	10	2
Day Dawn ...	8	1	Nil	...
Lake Austin ...	18	1	...	...
Lennonville ...	19	2	Nil	...
Mt. Magnet ...	60	3	Nil	...
Challa	37	2	23	1
Youeragabbie ...	...	...	...	...
Murrum	...	...	...	...
Burnerbinmah ...	33	3	...	...
Barnong	54	3	...	...
Mellenbye ...	78	6	4	1

RAINFALL—*continued*.

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
Gascoyne—*contd.*				
Yalgoo	33	2	13	2
Wagga Wagga ...	19	1	...	...
Gabyon	10	2	Nil	...
Gullewa	80	4	81	2
Muralgarra ...	13	2	...	...
Wydgee	...	...	...	...
South-West Division (Northern Part):				
Murchison House	21	5	...	...
Mt. View ...	52	3	...	...
Mumby	135	10	33	2
Yuin	...	...	...	...
Northampton ...	149	6	47	1
Oakabella ...	134	5	...	...
Narra Tarra ...	...	...	...	...
Tibradden ...	...	...	...	...
Myaree	170	11	...	...
Sand Springs ...	209	5	Nil	...
Mullewa... ...	101	9	81	2
Kockatea ...	99	6	82	2
Bootenal ...	...	...	...	...
Geraldton ...	90	9	29	4
Greenough ...	114	8	16	2
Bokara	140	13	25	2
Dongara ...	52	5	13	1
Dongara (Pearse)	52	5	...	...
Strawberry ...	182	8	2	1
Nangetty ...	159	4	Nil	...
Mingenew ...	158	9	13	2
Urella	72	3	61	1
Yandenooka ...	175	6	...	...
Rothesay ...	...	...	...	...
Field's Find ...	56	3	...	...
Carnamah ...	80	9	27	3
Watheroo ...	186	9	13	1
Dandaragan ...	290	12	61	3
Moora	317	12	20	2
Yatheroo ...	319	11	...	...
Walebing ...	214	13	60	4
Round Hill ...	161	11	...	...
New Norcia ...	172	7	91	2
Wannamel ...	...	...	48	2
South-Western Division, Central (Coastal):				
Gingin	396	14	77	4
Belvoir	443	11	43	3
Mundaring ...	473	10	...	...
Wandu	425	17	68	6
Guildford ...	390	13	55	4
Kalbyamba ...	326	11	69	4
Canning W't'r'w'ks	473	10	...	...
Perth Gardens ...	394	13	57	4
Perth Observatory	403	13	61	4
Subiaco	388	14	62	6
Fremantle ...	232	14	73	5
Rottnest	186	10	...	...
Armadale ...	344	...	...	...
Rockingham ...	338	11	68	4
Jarrahdale ...	802	10	158	4
Mandurah ...	271	12	74	3
Pinjarra	240	8	43	3
Yarloop	416	14	84	7
Harvey	368	14	56	6
Upper Murray ...	497	11	135	5
South-West, Central Part (Inland):				
Hatherley ...	131	9	...	...
Dowerin ...	115	9	...	...
Momberkine ...	...	...	...	...
Monglin ...	215	8	...	...
Newcastle ...	244	7	89	3
Eumalga ...	251	11	64	2
Northam ...	149	8	37	2
Grass Valley ...	142	7	24	2
Meckering ...	130	9	Nil	...
Cunderdin ...	176	9	33	2
Codg-Codgin ...	193	11	...	...
Yarragin ...	231	8	...	...
Doongin	116	8	...	...
Cuttening ...	191	9	25	2
Whitehaven ...	221	7	...	...
Sunset Hills ...	214	10	...	...
Cobham	199	13	29	3

RAINFALL—*continued.*

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
South-West, Central—*contd.*				
Yenelin	214	12	31	5
Mt. Caroline ...	158	5	...	...
York	188	8	24	2
Dalbridge ...	199	7	...	...
Beverley ...	138	6	26	2
Bally Bally ...	196	15	...	...
Barrington ...	189	11	...	...
Stock Hill ...	164	6	15	1
Sunning Hill ...	230	15	43	3
Brookton ...	184	11	42	3
Wandering ...	305	11	91	5
Glen Ern ...	...	...	...	...
Pingelly ...	178	6	10	1
Marradong ...	329	12	76	2
Bannister ...	243	9	...	...
Wonnaminta ...	214	3	37	2
Narrogin ...	251	15	63	5
Narrogin State Farm	257	14	31	4
Wickepin ...	...	...	...	...
Gillimanning ...	193	11	...	...
Bunking ...	274	8	...	...
Bullock Hills ...	275	9	...	...
South-West Division (Southern Part):				
Bunbury ...	250	14	60	4
Collie	312	14	68	6
Glen Mervyn ...	361	12	56	3
Donnybrook ...	323	14	128	4
Boyanup ...	355	14	...	...
Ferndale ...	359	15	...	...
Busselton ...	256	17	92	6
Quindalup ...	302	17	112	4
Cape Naturaliste	274	18	93	5
Lower Blackwood	408	17	129	4
Karridale ...	447	18	116	5
Cape Leeuwin ...	315	20	95	9
Biddellia ...	632	15	...	...
The Warren ...	684	18	190	7
Lake Muir ...	443	12	...	...
The Peninsula ...	308	19	124	9

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
South-West—*continued.*				
Mordalup ...	...	...	...	...
Deeside	420	15	171	7
Riverside ...	416	16	157	7
Balbarup ...	518	16	112	8
Wilgarup ...	...	...	...	...
Bridgetown ...	363	14	105	6
Westbourne ...	344	15	...	...
Hilton	333	10	...	...
Greenbushes ...	292	11	82	5
Greenfields ...	283	16	...	...
Glenorchy ...	305	11	...	...
Williams ...	165	9	29	2
Arthur	287	9	46	2
Darkan	...	...	...	...
Wagin	265	13	12	2
Glencove ...	344	15	34	5
Dyliabing ...	330	13	...	...
Katanning ...	296	14	14	2
Kojonup ...	399	15	50	5
Broomehill ...	238	12	43	4
Sunnyside ...	279	16	68	4
Talbot House ...	235	11	...	...
Woodyarrup ...	246	12	...	...
Mianelup ...	235	12	...	...
Cranbrook ...	307	15	...	...
Toolbrunup ...	255	16	88	5
Tambellup ...	330	15	40	7
Blackwattle ...	363	12	...	...
Woogenellup ...	379	13	...	...
Mt. Barker ...	487	18	159	9
Kendenup ...	430	16	424	16
St. Werburgh's...	366	15	161	7
Forest Hill ...	514	18	178	10
Denmark ...	513	11	227	5
Grasmere ...	587	18	175	10
Albany	567	18	165	10
King River ...	584	14	144	4
Point King ...	615	17	101	8
Breaksea ...	434	19	134	14
Cape Riche ...	...	...	...	...
Cherilallup ...	287	12	...	...
Pallinup ...	254	9	...	...
Bremer Bay ...	422	14	70	6
Peppermint Grove	426	17	...	...
Jarramongup ...	...	...	...	...

RAINFALL—*continued.*

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
Eastern Division:				
Dural	2	1	...	...
Wiluna	8	2	10	1
Gum Creek ...	Nil	...	...	...
Mt. Sir Samuel ...	34	2	...	...
Lawlers	12	5	1	1
Leinster G.M. ...	24	2	Nil	...
Darda	37	3	...	...
Lake Darlôt ...	...	...	...	...
Mt. Leonora ...	38	3	Nil	...
Mt. Malcolm ...	55	4	Nil	...
Mt. Morgans ...	57	4	Nil	...
Burtville ...	...	...	...	...
Laverton ...	80	4	6	1
Murrin Murrin...	58	2	Nil	...
Yundamindera ..	50	3	Nil	...
Tampa	32	2	Nil	...
Kookynie ...	65	5	Nil	...
Niagara	45	5	Nil	...
Yerilla	186	7	Nil	...
Edjudina ...	172	7	...	...
Menzies	85	6	Nil	...
Mulline	67	6	8	2
Waverley ...	159	5	10	2
Goongarrie ...	201	5	...	...
Mulwarrie ...	155	6	Nil	...
Bardoc	144	5	Nil	...
Broad Arrow ...	208	9	50	1
Kurnalpi ...	214	5	20	1
Bulong	180	5	Nil	...
Kanowna ...	180	5	Nil	...
Kalgoorlie ...	139	8	7	1
Coolgardie ...	187	10	70	2
Burbanks ...	172	7	23	1
Woolubar ...	257	7	...	...
Widgiemooltha...	182	7	23	3
50-Mile Tank ...	176	6	6	1
Waterdale ...	198	7	...	...
Norseman ...	203	9	55	4
Lake View ...	183	9	...	...
Bulla Bulling ...	148	9	44	3
Boondi	131	8	6	3
Boorabbin ...	140	8	7	1

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
Eastern—*contd.*				
Koorarawalyee ...	164	8	31	2
Karalee	225	5	95	3
Yellowdine ...	193	6	84	3
Southern Cross...	187	9	59	3
Parker's Range...	236	14	...	...
Parker's Road ...	128	4	...	...
Mt. Jackson ...	85	4	...	...
Bodallin ...	159	5	...	...
Burracoppin ...	198	8	4	1
Kellerberrin ...	238	10	10	1
Merriden ...	237	7	23	2
Nangeenan ...	185	3	11	1
Mangowine ...	...	...	...	...
Wattoning ...	228	8	...	...
Noongarin ...	183	6	...	...
Eucla Division:				
Ravensthorpe ...	245	13	78	8
Coconarup ...	257	10	...	...
Hopetoun ...	453	10	120	6
Fanny's Cove ...	407	10	...	...
Park Farm ...	457	15	...	...
Esperance ...	465	13	157	5
Gibson's Soak ...	452	12	...	...
30-Mile Condenser	369	12	...	...
Swan Lagoon ...	289	11	...	...
Grass Patch ...	...	...	...	...
Myrup	418	15	...	...
Lynburn ...	428	12	...	...
Boyatup	...	...	...	...
Middle Island ...	286	13	...	...
Point Malcolm ...	348	12	...	...
Israelite Bay ...	216	16	9	2
Balbinia... ...	...	...	...	...
Frazer Range ...	197	6	...	...
Balladonia ...	136	9	6	1
Southern Hills ...	203	3	17	1
Eyre	169	9	34	2
Mundrabillia ...	...	...	...	...
Eucla	191	12	16	2

The Observatory, Perth,
9th December, 1904.

W. E. COOKE,
Government Astronomer.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.